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Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

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AMERICAN
DYESTUFF REPORTER

VOLUME 25 JULY 13, 1936 NUMBER 14

Recent Research on Cellulose Fibers*–I

A Brief Review of Some Recent Foreign Work, Mainly on Cotton — The Cuticle of Cotton

THERE is research on cellulose fibers in progress in several foreign countries, which seems to be different in some respects from other work which has already been published, and with which we are probably more familiar.

It is hardly possible yet to say just how the results, in terms of cellulose fiber structure, are fitting in with other views on this subject. Some of the work clarifies ideas which we have already had while other parts of it are reaching out ahead and may not yet appeal to us as entirely plausible.

In some respects the new conceptions are not in entire agreement and in some instances it is a little difficult to make out from the publications in a foreign language just exactly what are the authors' findings and conclusions.

The attempt will be made by the present writer to cover some of the more important results of this work in several short articles based on the original papers of the authors, to which references will be given.

THE CUTICLE OF COTTON

The cuticle of cotton is a more or less indefinite thing to many of us. Haller has recently given, as a part of an extensive paper on the relations of fiber structure to processing (Textilberichte *16,* 185) an unusually good discussion of this important part of the cotton fiber, which is more significant to processing than is commonly supposed.

A cross-section of a cotton fiber treated with iodine and sulfuric acid has a characteristic blue color in the main part of the cell wall but the cuticle, or outside layer, is merely stained yellow brown. This is because the so-called "incrusting" substances which include fats, waxes, pectin and coloring matter are largely concentrated in this layer and give the cuticle its special properties. If these non-cellulose materials are removed the outer layer of the fiber takes on the properties of the underlying cellulose. The more completely they are removed, the more completely does it approach the main part of the cell wall in its properties and reactions.

The present writer would bring out a point here which may be implied but has not been definitely stated or explained in the original paper. Since the iodine reaction depends upon the adsorption of iodine by the swollen fiber substance, it would appear that the cuticle layer did not swell and did not, for that reason, give the characteristic iodine reaction. Since the cellulose in this layer is fundamentally like the rest of the cellulose it must follow that some of the impurities have "grown into" the fiber or been adsorbed in such a way as to block off the swelling.

EVIDENCE FROM BLEACHING

Bleaching has for its main object the removal of the various impurities. Hence by studying the effects of the processes of bleaching it has been possible to draw conclusions regarding fiber structure.

Starting first with a less drastic treatment, an extraction only of the fiber with a benzol-ether mixture to remove fat and wax does not change the response of the fibers to the copper-ethylenediamine swelling agent which acts in the same general manner as cuprammonium. They still give the familiar bead-like forms, so it is not these particular impurities that cause the special behavior of the cuticle to the swelling agent.

On the other hand treating with sodium hypochlorite at 1° Bé. for a half hour suffices to make a great change in the swelling with either cuprammonium or copper-ethylenediamine solutions. The fiber now swells uniformly and beads are entirely lacking. The oxidation has removed or changed some constituent of the cuticle so that it now has the same swelling properties as the ordinary cellulose. It is not certain what this constituent is.

There is a little evidence of a cuticle after treating with

*The first of a series of three articles.

hypochlorite. This can be demonstrated by first dyeing the natural cotton with a direct color fast to bleaching, such as Chloramine Orange G. If the fiber is then treated with hypochlorite and swollen there is no bead formation but the orange colored cuticle can be observed.

The next step is to give the same tests to cotton which has undergone a most careful purification with sodium bicarbonate at ordinary pressure, and bleaching by hydrosulfite, by reduction instead of by oxidation. Here there is no bead effect but the cuticle can be detected. In contrast, after a normal bleach with a caustic boil, and tests by dyeing and swelling there is no evidence of the cuticle.

When a cotton fiber which has been bleached only, with hydrosulfite, is swollen there is almost no difference from the behavior of a natural fiber. The hydrosulfite destroys color but it does not remove impurities which affect the swelling of the cuticle, nor does it have the same effect on them as an oxidation. The bead effects are still present.

If we examined mercerized fiber which has been subjected to a full bleach before mercerizing there is hardly a trace of cuticular membrane visible after a subsequent swelling treatment. Native cotton which has been mercerized at 19° Bé. shows, under the same conditions, the lack of the usual swelling forms, but the cuticle is still present.

There are then, specific actions of different treatments. Only a complete normal bleach under pressure can remove all those substances which cause the cuticle layer to give different reactions from the rest of the cell wall. Treatment with hypochlorites or mercerization dissolves out certain ingredients without altering the characteristic structure of pure cellulose.

EVIDENCE FROM DYES

The cuticle interferes with the absorption of direct dyes but readily absorbs basics applied directly without a mordant. The latter is due to impurities as indicated by the possibility of using Safranine as a stain, dyed direct, to show the extent of bleaching, through its greater or lesser depth of shade.

Incidentally the common opinion that unmordanted cotton does not have any affinity for basic dyes should be accepted with caution. Cotton may take up directly such amounts of basic dyes as would have some significance when using them as reagents, although not approaching a full shade in depth or quality.

With direct dyes the native cuticle resists the penetration of dye particles in consequence of its dense structure, in contrast to the much more homogeneous and more open structure of bleached cotton.

The difference is readily seen by dyeing natural and bleached cotton in the ordinary way with a direct dye and sodium sulfate, then washing well and swelling with copper-ethylenediamine solution. In the case of the natural cotton there will be seen a deposit of dyestuff on the cuticle layer and the almost undyed state of the main part of the swollen cell wall. In the bleached cotton the cell membrane is also dyed indicating free penetration or lack of hindrance at the outside layer of cuticle.

Only a treatment with alkali under pressure followed by an oxidizing action will remove from the cuticle the impurities which cause it to show its distinctive behavior. Hence in practical experience a bleach which does not have the severe kier boil does not remove the foreign materials and their presence, even in a bleached state, renders the goods likely to turn yellow upon storage.

The same thing is brought out in vat dyeing particularly with those colors which are dyed in the hotter, more strongly alkaline baths. Unbleached and bleached cotton are dyed in nearly the same way, not showing such differences in location of the dyestuff deposits as just described. This is because the bath has the effect of producing a bleached bottom. The alkali dissolves the greater part of the hemi-celluloses from the natural cotton while hydrosulfite effects a fairly good bleaching. The resisting action of the cuticle is thus overcome by the alkali and the fiber dyes essentially like bleached cotton.

RELATION TO OLDER EXPLANATIONS

The present writer would add that these explanations seem to help clear up some of the older views on cotton and its processing which have not been any too satisfactorily explained.

The old idea that mercerization removes the cuticle is not correct because the cuticle is not a definite outer layer of the cotton fiber structure and cannot, therefore, be removed. On the other hand it was correct to the extent that mercerization removes impurities from the outer layer which caused it to act like a different kind or structure of cellulose.

On this basis, too, it is not a cuticle that sets a limit to the amount of swelling during mercerization because the materials which give the effect of a cuticle tend to come off during the process.

The absence of a true cuticle has already been seen, in the experiments described, to modify views on the cuticle restricting the swelling of cotton by such reagents as cuprammonium solution and causing the bead-like forms.

The mode of growth of a cotton fiber does suggest that it might have a cuticle or an outer cellulose layer different in some way from the rest of the fiber. The fiber grows first as a very thin-walled cell to its full length, then the process changes to a thickening of the wall to its final form, by the addition of cellulose to the inside. Thus the outer layer was formed by the addition of cellulose in the direction of its length while the main part of the cell was built up by additions in a direction at right angles to the length. In these two cases the cellulose chains may be looked upon as added end to end in the first and side to side in the second. The resulting structures may not be identical although a difference between them due to this specific cause is not known to have been proven.

(To be continued)

Uses of

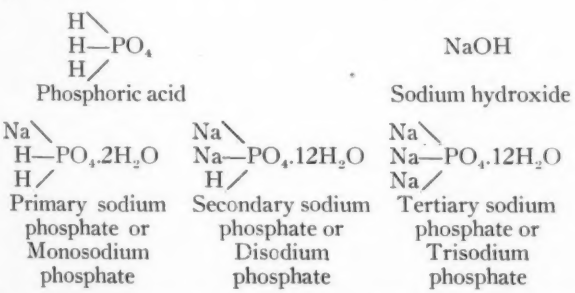
Phosphates in the Dyehouse

By NOEL D. WHITE

CONSIDERING the many uses the sodium phosphates find in the dyehouse it is quite remarkable that so little mention of them should be found in text-books and trade literature. True, they are often offered to the trade disguised under proprietary names or compounded with some other chemicals in which the phosphates lose their identity. For anyone desiring to learn something about them, the extent of their application to textile processing, which is which, and what is the best one to use for one fiber or another or in any particular operation, anything to throw some light over the phosphates, the most I could ever find was about an inch of printed matter in a whole library on technology.

The amount of phosphates used by dyers for various purposes being so great, how they are manufactured and the place they fill in the dyehouse should be of interest to dyers of every kind of textiles.

In a text-book of chemistry one finds that three phosphates are obtained from phosphoric acid and sodium hydroxide:



The primary or monosodium phosphate can be disregarded here as it is not used in processing textiles. It is the first obtained, according to the text-book, and a necessary step in the production of the other two.

The secondary or disodium phosphate is the most important, being used in large quantity in the weighting of silk skeins and fabrics. Being only mildly alkaline it can be safely used in processing the most delicate silks. In mixed goods where silk is present it is safer to use than trisodium phosphate, which, however, is also becoming recognized as a big factor in the processing of textile materials.

Many other phosphates are manufactured which are not of interest to dyers, but are prepared for medicinal uses and a large quantity also for agricultural purposes.

A funny incident, to which I happened to be a witness, occurred several years ago, when a Frenchman was brought here to take charge of a dyehouse in a mill that had been bought and operated by a concern of countrymen of his. This man was going to show us how to load silk piece goods and had ordered the necessary chemicals through the man who had hired him in France, perhaps for the sake of keeping the name of the chemicals involved to themselves. Evidently they did not know that there were phosphates other than the one they wished to use for loading the silk. The first barrel of phosphate that came to the dyehouse was a puzzle to my friend, the Frenchman, who having opened it, found the smell of the stuff unfamiliar to him. He asked me to look at it and if I knew what it was. I said laughingly, "Sure I know, it is phosphate. The best thing with which to grow potatoes and cabbages, if that is what you want it for." A gesture of despair, as only Frenchmen can execute . . . A few unprintable words . . . then a request for me to "order the right phosphate for weighting silk, if I knew what it was and how it was done." I told him I knew, had known for years and he should ask for disodium phosphate.

PHOSPHATE FOR TIN-WEIGHTING

For loading silk yarn and silk goods by the tin-phosphate-silicate process only disodium phosphate is ever used. Because of its mild alkalinity (a pH of 8.9 in a 1 per cent solution) often a slight addition of ammonia to the bath is necessary to better neutralize the acidity of the tin-impregnated silk.

The degummed and washed silk is first steeped in a bath of tetrachloride of tin, then washed and worked for one hour in a bath of phosphate, standing at 10 degrees Twaddle, at 150° F. The function of the phosphate is to fix the tetra chloride of tin to the silk and also to increase the affinity of it for the next impregnation.

The object of loading silk was at first to restore to it the loss of 20 to 25 per cent in weight that took place in degumming it. One impregnation of the silk in the tetrachloride of tin, then washed and worked in the phosphate bath, washed again and then worked for one hour in a dilute bath of silicate of soda would be enough to restore to the silk the full amount of weight it had lost from discharging the gum. Properly performed the operations leave the silk in a better physical condition, and improves the draping quality, brilliance and feel of the silk material. It was found, however, that the weight could be greatly increased by passing the silk through the tin and phosphate

baths several times until a return of from 28 to 32 ounces and even more, for every pound of silk so treated could be obtained.

Naturally this abuse did not improve the quality any further and it is quite probable that this has been one of the main reasons that brought about the high development of the different rayons, their increase in popularity, bringing the price of natural silk down in the last few years, lower than it has been and keeping it down for the longest time in history.

DISODIUM PHOSPHATE IN DYEING

Phosphate of soda, as the disodium is usually called to distinguish it from the trisodium, is often used as an aid to the dyebath, when mixtures of silk, wool, rayons and cotton are dyed in solid shades or many colored effects. Being a mild alkali its use is in retarding the absorption of dyestuffs by the animal fibers (silk and wool) and to increase the affinity of the vegetable fibers for dyestuffs.

When dyeing mixtures containing silk or wool and any vegetable fiber the phosphate is entered into the dyebath after the dyestuffs and the goods have been allowed to boil about twenty minutes, but always before any salt or Glauber salt is added. The amount to use is from one to two per cent of the weight of the goods. Except in special cases, when it is required to use a larger amount to reduce the color on the silk or wool, using more than the amount stated would only be wasting it and also induce a waste of dyestuffs as well. Even though phosphate of soda is a mild form of alkali the alkalinity it brings to the dyeing bath will be enough to reduce the affinity of the animal fiber quite considerably. If a system of pH control is at hand it would be well to find out the right degree of alkalinity to keep a dyebath for best results and phosphate is the best medium to obtain it.

HOW PHOSPHATES ARE MANUFACTURED

As manufactured commercially by one company the phosphates are prepared thus:

Phosphoric acid (75 per cent) and soda ash are mixed together and react to form a slurry of disodium phosphate, which can be crystallized and put up as such. A solution of sodium hydroxide is added to the disodium phosphate slurry to convert it to the trisodium. This solution of trisodium phosphate is filtered, and the phosphate recovered by continuous crystallization. The crystallized trisodium as well as the disodium are dried, screened to size and packed in bags or barrels for shipping.

Another form of sodium phosphate that is finding much favor and considerable use in the textile industry is the tetra sodium pyrophosphate. Its alkalinity is greater than the disodium, but without the causticity of the trisodium. It has the following important and useful properties:

1. Power to suppress the formation of insoluble soaps when used in hard water.
2. Buffering action in solution.
3. Emulsification of animal, vegetable and mineral oils.

Tetra sodium pyrophosphate can be used in conjunction with soap for degumming silk hosiery and other silk fabrics. It can also be used as a constituent of degumming compounds for degumming silk hosiery and as an addition with soap or other alkalies for scouring or boiling-off rayons and rayon mixtures in preparation for dyeing.

The emulsifying power of tetra sodium pyrophosphate is useful in the kier boiling of cotton to emulsify and keep in solution the waxes present in raw cotton, the calcium extracted from the cotton during the boiling and the calcium and magnesium present in the water in the kier-boil.

A COMPARISON OF THE pH OF PHOSPHATES

Disodium phosphate having an hydrogen ion concentration of pH 8.9 is the best phosphate to use in the weighting of silk, on account of the high concentration of phosphate required in a bath for that purpose. A phosphate with a high alkalinity would be disastrous to the silk.

In boiling-off on the other hand, the best degumming is obtained in a bath with a pH 10.6 to start with and decreasing, until at the end of degumming, to about pH 9.5. If the alkalinity of the bath is dependent on phosphate the disodium would not be the best for practical purpose.

Trisodium phosphate with a pH of 11.8 in a 1 per cent solution, induced by adding sodium hydroxide to the disodium phosphate slurry, would be a medium too caustic for good results in degumming silk. The action on the sericin would be too violet. Especially when processing silk hosiery in bags, with a bath so strongly alkaline, the gum would be stripped down too quickly on the most exposed parts of the batch in the bath. Leaving unprotected these parts of the hosiery, while degumming proceeds slowly on the hosiery in the inner parts of the bags, the danger of having weakened parts will be always present.

Tetra sodium pyrophosphate with a pH of 9.9 seems to strike a happy medium as an addition to the degumming bath. Its alkalinity being just right this phosphate can be added safely to the bath at the start, if needed to increase the penetration into some tight places in the hosiery, to complete degumming or to prevent an exhausted bath from breaking down before the operation is concluded.

Each of the phosphates mentioned has some property of its own, which makes its use preferable to the others. When dealing with silk or silk mixtures a phosphate with a low alkalinity is undoubtedly the best to use. In the dyebath especially, where the pH affects the affinity of the fibers for dyestuffs, the disodium is the best to use, as it promotes a saving in dyestuffs. In scouring, degumming, washing of soapy, scoured goods and kier-boiling the phosphate with a higher pH is much to be preferred.

The disodium can be used to correct the dyebath and secure a good match in a union of mixed fibers, to enhance or modify a shade without injuring the texture or putting the shade out of control. In dyeing rayon knitted goods that we could not get a level shade on, we decided to use a 2 per cent solution of trisodium phosphate in the scouring

bath. That corrected the situation. The alkalinity brought into the scouring bath by the trisodium equalized the acidity of the rayon and that trouble was eliminated.

When washing boiled-off, scoured or kier-boiled goods an addition of phosphate to the water will keep all residue of soap or oil from curdling, preventing the formation of pellets of grease, nigger heads and spots, keeping them well emulsified and easily washed out from the goods.

SHADES IN THROWN SILK

In throwing silk yarn the first and most important operation is the soaking to soften the gum to make the silk thread run loose and pliable, easy to wind. The soaking solution is usually prepared by dissolving olive oil soap, and adding to it neatsfoot oil, olive oil or glycerine to keep it hygroscopic, and without removing any of the gum, retaining the moisture for as long as possible. In this solution the silk is steeped for a number of hours at a temperature not to exceed 100° F. It is then removed, dried and is ready to wind. In recent years a number of preparations have been offered the throwsters to improve the hygroscopicity of this solution, its emulsifying property, its softening quality. Some of these solutions are made of sulfonated oils or fats, others are mineral oil preparations. Their efficacy is attested by the length of time they remain on the market and as far as the throwsters are concerned they soak their silk in what to them is the best for their purpose. When their thrown silk is delivered to the dyer in whatever form he gets it, whether in dress goods or hosiery, if these solutions do not come out in his degumming bath there is trouble at hand.

Silk that has been softened with a mineral oil preparation, if mixed with silk prepared with vegetable or animal oil solution, will invariably degum a different shade of white. The mineral oil in the silk will give it a creamish, darker cast that dyeing will not completely cover. A small percentage of tetra sodium pyrophosphate added to the degumming bath will emulsify and reduce the uneven cast in the boiled-off fabric better than anything else yet tried.

The same may be said in the case of freshly thrown silk that has been worked in the fabric with some older silk, where the throwing or knitting emulsions have oxidized on the fiber. Boiling-off baths with the phosphate will be found to strip the gum more uniformly than any other agent used to aid in the degumming bath.

PREPARING WOOLEN GOODS

Tetra sodium pyrophosphate can be used to advantage in preparing wool and worsted goods to be dyed and in the fulling and finishing process.

In preparing woolen materials to be dyed they must be scoured thoroughly first, to remove the dirt, natural grease and all impurities that may be in it. If not thoroughly done the dyed goods will show uneven streaks, have a harsh feel and possibly crock and bleed. The scouring must be done at no higher than blood temperature. Rinsing in this case with a small percentage of phosphate will be found quite effective and easily done.

Bearing in mind that goods well prepared are half dyed was never so true than in the processing of woolen goods; it will be found that the use of phosphate will help eliminate trouble and make the work easier.

There is no reason why dyeing and finishing of textiles should not be reduced to a matter of routine. Like any other chemical operation if all processing of fabrics are carried out according to established rules and formulas, attention is paid to details, dyestuffs and chemicals selected with understanding and care, troubles can and will be reduced to the vanishing point.

A Brief Survey of

Fault Causes in Rayon Fabric

By F. G. McKENDRY

BEFORE attempting to diagnose the cause of faults in rayon piece goods in the grey or dyed condition, it is important that suitable apparatus for full width inspection of the fabric be available. Moreover, inspection should be possible either under daylight or artificial illumination because the visibility of some defects becomes more apparent under one system of lighting than the other. Faults in rayon piece goods can be roughly apportioned into two groups, namely, inherent defects of the fiber and yarn and secondly, those developed by faulty processing either of the yarn or woven material.

As regards defects in fiber or yarn, consideration of these is more a matter for reference to the skilled technicians employed by rayon producing concerns than for the dyer or finisher. Be that as it may, there are occasions where a good dyer or finisher can partially conceal the more subtle faults in the fabric through adopting appropriate modification of processing procedure.

To consider first likely causes of faults in the woven fabric traceable to processes connected with the conversion of yarn into woven material a thorough overhaul of operations like winding, warping, pirning, sizing and twisting is

a first essential. A sharp lookout should be kept for apparatus which is turning out yarn of uneven tension because of the stretching effect of the weft or warp, this resulting in the development of stripiness during dyeing of the woven goods. The dyer can do something to reduce the conspiciousness of the stripes by slightly delustering the affected pieces and subsequently restoring the original sheen as far as possible. In cases where irregular tension in the weft has brought about the appearance of "bright picks" in the fabric, to reduce the prominence of the fault is a difficult matter for either dyer or finisher and in bad cases the problem is insoluble at this end of processing operations. The finisher can sometimes improve matters by paying special attention to width tension during tentering of the fabric.

Faulty processing during the sizing of rayon yarn or the use of unsuitable size for the work in hand can cause a lot of trouble at the finishing end in the matter of streaky pieces and "shiners" through uneven tension. It is a prime essential that rayon size should be easily removable from the fiber by means of a light scouring only.

A considerable number of faults are entirely traceable to the weaving process. Unfortunately, these defects are not always obvious, even to the trained observer, until the fabric has been dyed and finished.

Oil stains are fairly easy to remove during the scouring of the pieces provided the residium of grit and metal dust which usually accompanies such soiling is inconsiderable. The gritty particles become firmly embedded in the filaments and are extremely difficult to entirely remove without eventually chafing the fabric. An application of benzine soap or one of the proprietary stain removers is effective in getting rid of the grease but does little towards removing the metallic soiling. Where the weaver habitually repairs fractured warp threads while the hands are in a dirty or perspiring condition, the result may be the appearance of a variable number of tiny soil marks here and there throughout the piece. A preventive against this defect is for the operative to apply finely powdered Fuller's earth or French chalk to the fingers before knotting the broken warp strand. The provision of weavers' knotting machines would also be of service. The weaving defect known as box-marking is, as is well known, brought about through the trapping of weft between the shuttle-box and the shuttle. Box-marking shows as a series of dirty marks about half an inch in length visible in alternate picks at a distance of 8 to 12 inches from either selvage of the piece.

Rayon piece goods in the grey are easily damaged by plaiting and cuttling in tight formation, for crease marks frequently develop at the folds, this fault usually becoming manifest after the goods have been dried following dyeing. It is far preferable to roll rayon piece goods for storage in the grey rather than to store in the cuttled or plaited condition. This ruling holds good even for temporary storage of but a few hours' duration.

Friction marks occurring in dyed rayon piece goods occasionally prove troublesome in tracking them to the source. According to the degree of friction suffered by the fabric the fault may show merely as a slight periodic glazing of a portion of the surface, or in a more serious case there will be marked chafing of the filament. The causes of friction marks are manifold and loose or defective fittings in any one of a number of machines may be responsible. For instance, an inspection of the apparatus may disclose that an expanding roller has somehow gone out of alignment and a section is exerting an undue or unequal amount of pressure on the fabric, again, a rough projection or boss may have developed on a winch rail or a mangle roller through the gradual erosion of softer contiguous material. It is also possible that a loose rivet or flap joint in a dye or scouring kettle is the factor causing the damage.

The presence of an undue amount of alkali dyestuff or dyebath assistants may cause the development of a defect resembling watermarking in paper to appear in acetate rayon fabric or rayon unions through partial saponification of the rayon.

Let Orders Emanate From a Common Source

A Fundamental of Business Management

IT would hardly be possible to find a condition or circumstance which will so completely undermine the general morale, efficiency, and even loyalty of an employee as that of making him answerable to two different supervisors whose orders or instructions may by any chance conflict. Supervisory directions must positively come from one man whose word is final authority, so far as any one worker or any closely-connected group of workers is concerned. Where some worker is concerned whose activities cannot be construed as falling under the supervision of any particular departmental foreman, it is best for the superintendent to make a careful study of that workers status, and to render a final and careful decision as touching the one source from which that worker should receive his orders.

The superintendent or the manager must themselves be careful in the issuance of orders, lest under the stress of heavy cares or duties they inadvertently give an order directly which should have been given through the departmental foreman, through the maintenance foreman or through some other duly appointed and recognized supervisor. Giving an order directly, even though it be done under stress or under peculiar circumstances, will leave the supervisor through whom it should have been given, in ignorance of the order. Further, it will encourage the individual worker, who may not like his immediate superior for any reason, to "go over his head", or at least make an attempt to do so, on the slightest provocation. It is better, therefore, to adhere rigidly to the principle of "orders from their proper source" at all times, even though such adherence may at times cost something extra.

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Standard Wash Fastness Samples

Cotton, Wool, Silk

The standard samples which have been in preparation for some time by the Sub-Committees on Fastness to Washing of Dyed Cotton and Dyed wool are now ready for distribution, and the original standard silk sample cards have been revised to correspond with the new system of classification first introduced in the 1934 Year Book.

These standards have all been carefully dyed with the dyestuffs and according to the dyeing methods recommended in the 1934 Year Book and each set includes a dyeing representing each of the different classes of fastness.

With these sample dyeings for reference it will be possible to accurately grade the fastness to washing of any dyed cotton, wool, or silk fabrics, by comparing them with the standards after subjection to the standard washing tests as approved by the Association.

The A.A.T.C.C. is now prepared to furnish these three sets of washing standards for $3.00 or $1.00 per individual set which is to cover the cost of preparation.

All inquiries concerning these washing standards should be addressed to the Chairman of the Research Committee.

LOUIS A. OLNEY,
LOWELL TEXTILE INSTITUTE,
LOWELL, MASSACHUSETTS.

Problems in the Dyeing of Linen Fabrics with Fast Colors*

By ORMOND W. CLARK†

TO dye fast colors efficiently, requires sound technical supervision, excellent equipment, and constant attention to detail. The problems to be met vary greatly with the type of work, which extends from the continuous machine dyeing of vast yardages in a few standardized light shades, to the dyeing to specification of single orders encompassing a full variety of shades with only a few hundred yards per shade. My experience is most directly related to the latter phase of dyeing and to it I shall therefore chiefly devote this discussion.

In this kind of dyeing, the provision of well-designed and well-maintained equipment in a sufficient variety of types is requisite for satisfactory workmanship. The equipment should include a well arranged color room with accurate scales and convenient dissolving and mixing apparatus. For a full range of dyeing, jigs, padders, continuous machines, and reel machines are necessary, for each can perform a specific function better than substitutes.

Cast iron, 100 gallon jigs with monel, stainless steel, or with rubber covered rollers are not expensive, resist the chemicals well, produce a fairly satisfactory product and are the style I have had to be satisfied with. It would seem that constant speed, automatic jigs with cut spiral bronze gears, sensitive tension controls, modern clutches, temperature control, and vacuum extraction should produce the best workmanship at least cost.

Constant speed permits the selection of the specific uniform speed to produce the highest rate of fabric travel consistent with the counteracting factors of excessive liquor agitation and centrifugal effects. Automatic operation allows more jig units per operator, and allows the operator more closely to inspect the cloth and dyebath during dyeing. Cut spiral bronze gears and modern smooth working clutches increase the life of the equipment, are gentle in their action on the fabric, and decrease the amount of seconds at the ends of the rolls of cloth. Sensitive tension controls can be set so that the fabric is under just sufficient tension to maintain a smooth surface without the tension being sufficient to prevent penetration of the dye or to accentuate two-sidedness. This factor of tension versus level penetrated dyeing has necessarily been given little attention when antiquated jigs with poor brakes have been used, but it should be emphasized that no chemical penetrating assistant can overcome the effects of too much jig tension. Temperature control removes one variable from a difficult dyeing operation. Vacuum extraction at the jig permits the rapid removal of excess dye liquors from the fabric, expediting oxidation processes, minimizing chemical consumption, and reducing crocking.

Various types of padders are used in this country and abroad for the dyeing of fast colors. They all attempt to secure perfect penetration and to reduce the dyebath to a minimum volume. Some of the complicated and novel foreign padders use as many as four squeeze rolls with multiple nips to squeeze out air before the cloth enters the dyebath and to force the dye into the fiber, with ingenious arrangements for retaining the dyebath within the area enclosed by the squeeze rolls. A simple padder which in general is quite satisfactory and embodies the fundamental requirements, consists of two rubber-covered rollers at least 12 inches in diameter, with one roller softer than its mate, a monel pan concentric with the bottom roller and with a minimum clearance so as to require only three or four gallons of dyebath, a revolving immersion roller to prevent the rubbing off of lint and to help prevent two-sidedness, a splash plate to keep scum and splashes from the nip off of the dry entering fabric, a spray feed pipe, and a monel lined supply tank. A pump circulatory system, an agitator, and temperature control would seem requisite for the best workmanship, but the dyeing industry being what it is, many plants consider these additions unnecessary refinements.

The continuous dyeing machine usually consists of a padder followed by a multi-compartment open width washer, followed perhaps by rope soapers and can drying equipment. Usually the bulk of the color is applied on the padder, thereby securing penetration and level dyeing. Further dyeing may occur in the first boxes of the washer, by the provision of suitable chemical baths with or without dye, whereby the fastness properties are greatly improved and better color value is secured. The subsequent roller compartments provide washing, oxidation, and soaping treatments to complete the process. The successful dyeing of large yardages with good uniformity and low

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seconds is attained on these machines by careful chemical control and proper mechanical maintenance.

The reel machines are used for the preliminary treatment in the rope form of certain suitable cloth constructions before dyeing, and for the dyeing in the rope form of developed and aftertreated colors when the maximum fastness must be secured from this type of dye. The older type of machine has a large rectangular dye vat usually wooden, surmounted by an oval slatted reel which draws the strands of cloth forward through the dyebath to the front of the machine, up between the sticks of a pin rail, across the top of the machine towards the rear, where the cloth plaits down into the dyebath. The newer types of reel machines have dyebath resistant metal lined tanks to facilitate cleaning and to reduce friction on the cloth. The pin rail with its tendency to chafe the cloth is replaced by free floating partitions in the dyebath, and two overhead reels perform the functions combined in the older machines in one reel.

Not a dyeing operation, but nevertheless of much importance in its effect upon the fabric is the removal of excess moisture from the dyed fabric just previous to drying. The four main devices for removing excess moisture are the water mangle, the centrifugal roll extractor, the centrifugal basket extractor, and the vacuum extractor. The water mangle, designed to leave less than 85 per cent moisture in the fabric is well suited to the denser constructions and to situations where the variety of shades is not sufficient to cause too frequent cleaning of the rolls. The centrifugal basket extractor is used for cloth in the rope form, but the speed and the duration of the extraction cycle must be so controlled as to prevent the formation of hard creases. The centrifugal roll extractor is best suited to quite porous constructions which insure a free flow of liquid from the interior of the roll radially to the periphery, and demands only a simple and infrequent cleaning. The vacuum extractor removes the excess liquid from a single layer at a time and the absence of the filtering action existent in the roll extractor, particularly on the denser fabrics, insures a cleaner fiber and much less crocking in the case of dark shades.

Several classes of dyes are available for fast color work on cotton and linen; vat dyes, water soluble vat dye derivatives, insoluble azo dyes, sulfur dyes, and developed and aftertreated dyes.

The vat dyes are now available in paste form, in powder form, and in colloidal powder form. From the dyers' viewpoint colloidal powder is the ideal state, because it may be utilized in all dyeing processes, is easy to handle, and does not change its strength on storage. Only a limited number of vat dyes are at present available in the colloidal powder form, and some manufacturers' types do not yield full color value, but the best of them yield full color value, disperse completely in water, give excellent penetration in pigment padding without the use of additional suspending or penetrating assistants, and vat very quickly. When the use of vat dyes not available in colloidal form is necessary the powder dyes are most suitable for reduced vat dyeing, and the paste dyes are essential for pigment dyeing.

The water soluble vat dye derivatives, now available in sufficient types to permit the dyeing of a wide range of shades of excellent fastness, are very valuable for application to certain fabrics which are extraordinarily difficult to dye satisfactorily with ordinary vat dyes. Because of their high cost they are suitable mainly for light shades, but for very light shades the total dyeing cost is often less than for true vat dyes, due to the low consumption of inexpensive chemicals. They are excellent for dyeing heavy linen suitings and for the continuous machine dyeing of shirting broadcloths.

The insoluble azo dyes are indispensable for the production of full bright red and wine shades at reasonable cost. They are very useful for dyeing full shades of yellow, orange, navy and violet, and find a more limited use in dyeing brown, black, green, pink, and rose shades. Compared with the vat dyes, they are bright and full, comparatively cheap and in many cases of equal fastness. Their chief defects are a tendency to crock badly, and often poor fastness to hot pressing. Rigid adherence to the correct dyeing procedures will minimize the crocking, and correct selection of the components will prevent trouble from hot pressing. Satisfactory results in the application of a wide variety of the insoluble azo dyes to different classes of fabrics demand skillful dyeing and considerable experience.

Sulfur dyes are chiefly used for blacks and browns. Their fastness is distinctly inferior to that of the vat dyes. Severe washing gives the sulfur dyed fabric a very undesirable dead appearance with a grayish overcast, and of course their fastness to chlorine is poor. However the vat dyed browns and blacks, especially in full shades are so very expensive that for many purposes the sulfur dyed shades, in view of their low cost and fairly good all around fastness must be used.

The developed and aftertreated dyes are used when somewhat better fastness to mild washing is required than can be produced by direct dyes, where the other fastness requirements are relatively unimportant, but where the cost of production must be very low. This line of dyes is deficient in bright blues, violets, and greens. The method and care used in dyeing exerts considerable influence on the ultimate fastness. Dyeing in the long bath of a reel machine, with the use of adequate amounts of chemicals in diazotizing and developing, followed by a soaping treatment, produces the best possible fastness.

In illustration of some of the problems arising in the actual production of fast colors on linen, an analysis of a typical dye order will be helpful.

The order to be studied calls for the dyeing of a ten-

ounce linen suiting in a line of shades for women's sportswear. The order specifies 500 yds. per shade of Pink, Maize, Lt. Blue, Aqua, Gold, Copen, Reseda, Turquoise, Dubonnet, Violet, Rust, Emerald Green, Brown and Navy.

A ten-ounce linen suiting is very difficult to penetrate, but excellent penetration is requisite. Sportswear receives hard usage, and poor penetration would result in the garment showing white patches where frictional wear removed the surface fiber and color. Linen sportswear is frequently worn in the tropics and on cruises, and the combination of outdoor exposure to dirt and sun indicates a selection of dyes with maximum all around fastness. Frequently sportswear is pleated and the hot moist steam of the pressing machines will badly affect dyes of inferior fastness to hot pressing.

A heavy linen suiting must be handled in the open width at all times to prevent break marks. When running on the jig very careful adjustment of tension is necessary to prevent wrinkling and to secure proper penetration.

Consideration of all the foregoing factors and the additional factor of cost leads to the following conclusions:

The pink, maize, light blue, and aqua can be economically dyed with water soluble vat dye derivatives on the jig. The large poundage of cloth and a short liquor result in efficient utilization of the dyestuff. Dyeing at 140° F. will give good penetration. A typical formula follows:

Jig

Scarlet IB—2 lb.
Soda Ash—¼ lb.

20 gal. at 140° F.

The trace of soda ash is added to prevent premature oxidation of the selvedges which sometimes occur in a dyehouse where the air may contain acid fumes from other processes. A trace of hydrosulfite formaldehyde is also sometimes added to prevent premature oxidation. It is often desirable for the same reason not to add the nitrite of soda to the dyebath until the final two ends.

Procedure

End

1. Wet out at 140° F.
2. ½ dye
3. ½ dye
4. 5 lb. salt—4 oz. nitrite of soda
5. 5 lb. salt—4 oz. nitrite of soda
6. 30 gal. at 160° F. containing 2 gal. sulfuric acid and
7. 4 oz. of nitrite of soda
8. Running cold water
9. Running cold water
10. ½ lb. sulfonated fatty alcohol } 100 gals. boiling
11. 3 lb. soda ash }
12. Running warm water
13. Running warm water
14. Shell up

The only variation from the usual procedure occurs in the use of blues of the IBC type. To obtain the correct shade it is best to oxidize in one run using two jigs, with running water in the second jig and shelling up on the second jig to maintain a constant developing rate. The addition of glucose to the soap bath will accelerate the production of the correct shade.

The gold, copen, reseda, and turquoise are too dark to produce economically by the preceding method. They are best produced by pigment padding the fabric with vat dyes, followed by jig reduction, oxidation, and soaping.

A typical formula follows:

Padder

Colloidal Blue BCF Double Powder—10 lb.

40 gal. at 180° F.

Jig

Caustic Soda Flakes—15 lb.
Hydrosulfite — 6 lb.

100 gal. at 120° F.

Procedure

End

1. No addition
2. No addition
3. 2 lb. Hydrosulfite
4. 2 lb. Hydrosulfite
5. 2 lb. Hydrosulfite
6. 2 lb. Hydrosulfite
7. 100 gal. cold water
8. 1½ lb. ammonium persulfate and 8 lb. acetic acid 56 per cent, at start and at middle of 1st end.
9. 5 lb. soap flakes and 3 lb. soda ash and 2 lb.
10. glucose—100 gal. boiling
11. Running Hot water
12. Running Hot Water
13. Shell Up

In most cases, oxidation with ammonium persulfate offers several advantages, over oxidation with sodium bichromate. Shades usually come up brighter with persulfate oxidation, and the cloth can be run immediately into the soap and soda bath without intermediate rinsing. However ammonium persulfate has a detrimental action on certain dyes, particularly of the jade green type which seem very suceptible to over-oxidation.

I have some tests that were made to show the effect of different methods of oxidation. They show the increased brightness resulting from persulfate oxidation. In the case of the green the optimum concentration of ammonium persulfate is very critical, and of course under practical operating conditions it is impossible to maintain so critical a concentration. Over-oxidation turns the jade green to a dull brownish cast.

The first time I found out that ammonium persulfate would affect jade green so markedly was in this way: As I remember, I had about 6 rolls of a Nile shade on the jigs. The rolls just finished running through the oxidizing bath at 5 o'clock, and I figured it was safe enough to give them a cold water rinse, and leave them on the jigs for soaping in the morning. The next morning, the sides of the rolls were green all right, but the top and bottom, where the liquor had drained down through, was

a nasty brown shade. At that time it was not so easy to correct a faulty dyeing, as it is today, for many of the present leveling assistants were not then available. That lot was quite a problem.

The dubonnet, violet, and rust are best dyed with insoluble azo colors, as vat shades of this depth are very costly. The components used must be carefully selected, often the simplest combination to produce the required shades not being usable on account of some deficient fastness property. The most satisfactory napthols for jig dyeing and to give the best fastness to crocking are the highly substantive ones. Another point to watch in selecting napthol combinations is to select the combinations which change shade least on soaping, otherwise shading of the roll at the ends may occur during the soap treatment.

A typical formula follows:

Formula—NAPTHOL

Napthol AS-SW	—7.0 lb.
Cellosolve	—1 gal.
Caustic Flakes	—1.4 lb.
Igepon T	—0.25 lb.

Jig—NAPTHOL BATH

20 gal. at a boil with 2 lb. Caustic Soda Flakes

Formula—DEVELOPER

Fast Scarlet Salt GG	—21.0 lb.
Diazopon A	— 1.0 lb.

Jig—DEVELOPING BATH

40 gal. cold water containing 10 lb. of salt.

Procedure

End

1. Wet out boiling
2. ½ dye
3. ½ dye
4. No addition
5. No addition
6. 5 lb. salt
7. 5 lb. salt

(2–7: 20 gallons 4E boiling 2E cooling)

8. 9. 100 gal. cold water containing 10 lb. salt.
10. 11. 12. 13. 40 gal. cold water containing 10 lb. salt. ½ developer at start and the rest fed on during the first end
14. Running cold water
15. Running cold water
16. 17. 10 lb. soap, 5 lb. soda ash — 100 gallons boiling
18. Running hot water
19. Running hot water
20. Running hot water
21. Shell up

Penetration of the developer is aided by running the cloth from shell to shell during the developing. Prolonged soaping does not improve the fastness to crocking of the napthol dyes, because the pigment gradually migrates from the interior of the fiber to the outside surface. Best results are obtained by using a strong soap bath, about 8 or 10 pounds of soap and 3 pounds of soda ash to the hundred gallons, and running 2 to 4 ends at a boil, followed by repeated hot water rinsing.

The emerald green can only be produced with vat dyes because of its brightness, but the cost is terrific. Pigment padding to secure penetration and the addition of the residual padding liquor to the jig will suffice to keep the cost as low as possible. The procedure is nearly the same as previously outlined for the copen. Additional caustic and hydro will be required in the jig. Oxidation is best executed with sodium bichromate instead of ammonium persulfate. Jade Green is quite susceptible to over-oxidation, the result being a brown cast to the shade.

The use of vat dyes for dark browns is usually prohibitive in cost and a passable fabric is usually produced by dyeing with the best of the sulfur colors. Penetration cannot be produced on the jig. The fabric is padded with the dissolved sulfur dye and further dyeing proceeds on the jig.

Pad Formula

Sulfur Brown	—30 lb.
Sulfide Chips	—45 lb.
Soda Ash	— 5 lb.
Glucose	— 5 lb.

40 gal. at 212° F.

Jig Dyebath

Sulfide	—45 lb.
Soda Ash	— 5 lb.
Glucose	— 5 lb.

40 gal. at 212° F.

Procedure

End

1. ½ Residual Dye)
2. ½ Residual Dye) 40 gal.
3. 5 lb. salt) Boiling
4. 5 lb. salt)
5. Running cold water
6. Running cold water
7. Running cold water
8. 40 gal. boiling
9. 4 lb. chrome and 8 lb. acetic added at start and middle of 1st end
10. Running hot water
11. Running hot water
12. 13. 100 gal. boiling containing ½ lb. of sulfonated fatty alcohol
14. Running hot water
15. Running hot water
16. Shell up

There are several possible ways to dye the navy. An insoluble azo navy would give the correct shade at reasonable cost, but the slubs would not dye properly and barré effects would be accentuated. The sulfur navies which exhibit sufficient brilliance do not dye well on the jigs because of their extreme tendency to bronziness. The high-

est grade vat navies are very expensive. The cheapest vat navies of the hydron blue G and R type are not sufficiently fast to washing and crocking. There are available navies of the Indigoid type and also just recently available of indanthrene type, which give reasonable fastness to a permissible cost. They are best dyed by the pigment padding process.

What applies to the suiting fabrics will more or less apply to the 4 ounce dress fabrics.

The cambric and sheer linens, are not so difficult to dye. A fairly presentable appearance may be produced by jig dyeing. The more exacting trade will not accept such a product, however, and the light shades must be dyed with water soluble vat dyes, and the darker shades must be pigment padded.

Aside from such specific problems as illustrated in the dyeing of the preceding fabrics are certain general problems which apply to all fast color dyeing.

Rare today is the dyeing order which does specify "exact match to sample." In practical dyehouse operation this means as close a match as possible consistent with reasonable production. In general, the more exact the match the less the production; an exact match often requiring an inordinate amount of time, while a reasonable match does not unduly interfere with production, assuming that the greatest possible skill is available to supervise the dyehouse.

An accurate and extensive file of formulas with attached swatches from the important steps of the operation is invaluable, especially in pigment dyeing. Careful testing of dyestuff shipments forestalls difficulties in bulk dyeing due to variations in the dyes. Selection of those dyes which change the least in the oxidation and soaping treatments is helpful to accurate matching. For example, orange 3G is preferable to orange G, and blue BCS is preferable to blue GCD. Obvious is the necessity for careful control of the dyebath ingredients, the checking of temperatures, and the strict supervision over the machine operators.

The close matching of fast color shades on cotton is much easier than on linen. The sources of flax are so widely distributed over the world, the retting, scouring, and bleaching processes are so variable, and the linen fabrics are so lacking in uniformity, that the fast color dyeing of linen to close matches offers a constant struggle to the most skillful dyer. Never can the linen dyehouse be turned over to a routine dyer, no matter how well fortified he may be with formulas from past productions.

By the time a linen fabric arrives in this country, the dyer has no way of knowing whether it is like the last lot, and usually it isn't. I have here some particularly bad examples of linen fabric. One sample shows very marked warp streaks, and the other shows filling bars, as bad as ever occurred in the early manufacture of rayon fabrics. Naturally, when the dyer must contend with a fabric showing filling bars, he cannot match the shade accurately, for he does not know whether his patch comes from a light or a dark bar, and can not tell whether the patch is representative of the cloth or not.

A problem occurring in all dyehouses is the question of redyes. Error being inherent in mortal man, redyes will occur in the best run dyehouse. Rectification of seconds does not offer the problem today that it did several years ago.

Many of the vat dyes which were impossible to level years ago now yield to such assistants as Peregal O in conjunction with caustic soda and hydrosulfite, sodium sulfide, glucose, leucotrope, and such chemicals in high temperature baths. The judicious use of a permanganate bleach is sometimes helpful.

Most of the insoluble azo dyes can be reduced with caustic soda, sodium sulfide, hydrosulfite, and diazopon A, followed by redyeing to the correct shade.

The rectification of sulfur dyeings is of course easy, in the case of simple defects a new bath of sodium sulfide and caustic soda sufficing; and in the case of severe defects, a chlorine bleach followed by redyeing sufficing.

There is a sample here of a napthol dyed fabric from a foreign country and you can see what is the effect of poor penetration. The minute that fabric is worn and subjected to a little wear the threads will slip and the white underneath will show through.

The same thing applies here on one of the napthol reds. Maybe I can show you how badly a napthol can crock. (Laughter).

. . . Mr. Clark illustrated his remarks by rubbing a white handkerchief on a piece of cloth. . . .

Mr. Clark: That wasn't dyed in this country. That was dyed in Czechoslovakia. (Laughter).

And there is one of the dyeings from this country. It crocks, but it is considerably better. (Laughter). I don't think the crocking problem has been solved yet in this country, although we seem to get a passable fabric.

I guess I have covered the high spots of fast color dyeing on linen fabrics. If any of you would like to ask questions, I will be glad to answer them. (Applause).

DISCUSSION

Chairman Freedman: Are there any questions?

Mr. C. S. Pierce: Should the dark colors be expected to crock slightly?

Mr. Clark: Yes. We would like to dye them so they won't but it doesn't seem possible with the present state of the art.

Mr. Pierce: But they shouldn't be expected to crock more than slightly?

Mr. Clark: Not more than slightly if they are properly dyed.

Mr. Philip Moran: How do you oxidize your scarlet vat colors?

Mr. Clark: Light shades?

Mr. Moran: Any kind, light, medium or dark.

Mr. Clark: We dye our scarlets with napthols.

Mr. Moran: You don't use any of the Indanthrene range of scarlets for your roses, light shades of pink?

Mr. Clark: Not at all. In the pinks we use the water soluble vat dyes, of course.

Chairman Freedman: Are there any other questions?

Mr. Clark: I might mention one other point that will help the crocking. That is the method of extraction after dyeing. If you are roll extracting you are going to get a filtering action whereas a vacuum extraction will give a much better cleansing action on the fiber.

Chairman Freedman: Mr. Clark, I might say that some of the linens that are on the market, when not sufficiently pre-shrunk to satisfy the purchaser, are taken and immersed in water, sometimes in cold water, and then a leaching of color is observed with a streaking of the fabric due to the improper insufficient removal of dyestuff.

Mr. Clark: Yes.

Chairman Freedman: That would seem to indicate the necessity for the proper removal of color in the dye house, i.e., of excess color, would it not?

Mr. Clark: That is perfectly true, and the only thing probably that prevents it are practical considerations, considerations of production. In a dyehouse you usually are interested in getting out as large a production of passable fabric as possible. That is putting it quite bluntly, but that is the situation.

There are lots of things you could do, but for reasons of production or cost you don't do them. There is no question that the loose color that is removed by cold water shrinking of a fabric could be removed before the fabric goes on the market. Perhaps some day it will have to be. Today it isn't.

Chairman Freedman: How would you account for a deep tone brown—resembling this in color—after returning from the laundry looking something like this gold?

Mr. Clark: It probably went through the chlorine bleach although laundries never use chlorine on colored goods, they tell you.

Chairman Freedman: Subjecting some of the material to a two-tenths per cent chlorine solution, and some of it to a soap solution containing as much as five per cent of chlorine failed to produce any change in color, let alone produce this golden color.

Mr. Clark: How does it behave on severe soaping?

Chairman Freedman: It wasn't affected.

Mr. Clark: I can't answer that one.

Chairman Freedman: I think that laundry has a gold mine if it can duplicate the job.

Member: Are you sure it was the same fabric?

Chairman Freedman: That is a very good question. I would like to say yes, I believe it is. That is as far as I can go with it.

Mr. Whalen: May I ask whether your general remarks —naturally your detailed remarks wouldn't apply to rayon —but whether some of the principles you have enunciated apply to rayon?

Mr. Clark: What type of principles?

Mr. Whalen: I am speaking of spun rayon linens, for instance.

Mr. Clark: I think you will have to be more specific.

Mr. Whalen: I am sorry—but of course as you know, spun rayon linens at present are not dyed on jigs. I don't believe they are. Do you think it would pay us to transfer our ideas over to jig work?

Mr. Clark: What is wrong with the method now being used? What is your criticism of the present method?

Mr. Whalen: Everything that you have mentioned tonight so far applies to fast dyed colors.

Mr. Clark: Yes.

Mr. Whalen: And I was just wondering whether it wouldn't be a good thing for dyers to go into that idea on rayon too. What is your idea on the subject?

Mr. Clark: It is very hard to express an idea on that without knowing what your criticisms of the present methods are: If the present method is satisfactory why change it?

Mr. Whalen: There is no criticism of the present method, but of course your idea naturally is to give your customer even better specifications than he asks for.

Mr. Clark: Yes.

Mr. Whalen: Do you think it would pay us to go into that idea, vat colors, and the insoluble Azo colors? Is there anything in it?

Mr. Clark: Well, if you can get a price that would make it worth while.

Mr. Whalen: I wasn't thinking about it in those terms at all. I was thinking in terms of giving the customer something better than we have been giving so far.

Mr. Clark: You might be able to produce a more uniform fabric and a better penetrated fabric.

Mr. Whalen: Do you think so?

Mr. Clark: There is a possibility.

Mr. Whalen: Do you think it is worth while going into in a research way?

Mr. Clark: Yes, in a research way, because at small expense you can find out whether there is anything in it or not.

Mr. Whalen: Do you think there is a market for it?

Mr. Clark: I don't know anything about the market. I know I worked on a research proposition about six months one time, with a company that wanted to dye a tubular knit rayon with vat colors, and after they spent about $10,000 and developed a more or less workable process, they found out that nobody was going to pay them for doing it. It was a sad experience.

Mr. George L. Baxter: I think what brought this question up is the cloth known in the market as a linen, but it is an all spun rayon. It really is a misnomer. It has no connection with a real linen fabric at all. So far as dyeing it with vat colors is concerned, it is being done, for there is very little sale for it in the market at the prices that you would have to get for it. The cloth has become entirely too competitive.

Mr. John E. Dougan: On the other hand, you have to face certain factors in regard to fastness, for instance your cold water test. You take a piece of fabric, particularly linings and place it in cold water and in a short space of time, sometimes almost a few moments, all the lovely color that you have dyed on said fabric immediately comes out. When you are confronted with a problem like that I think it would be necessary to go into a faster color than the direct colors or even the developed colors.

Mr. Clark: Yes.

Mr. Dougan: Because even the developed colors will come out in cold water. On the other hand it would be nice if a satisfactory method of applying the sulfur colors could be found. Apparently up to now applying it in a jig isn't satisfactory enough but I think that a pigment padding operation in combination with the jig, as you are using it on your linens, would be satisfactory, especially to the Bradford people over there.

Mr. Clark: Yes, but as he says, no one wants to pay you for doing it.

Mr. Dougan: They will have to because your converter friends will immediately place the cold water in front of you and say "Why, my dear man, this is no good."

Mr. Clark: There is no fundamental technical reason why it can't be done.

Mr. Dougan: We textile people have tried in every way possible to sell you direct colors but our direct colors are not good enough, and you will have to go into the more expensive colors.

Mr. Baxter: I might say in that respect that your developed colors on the Solenol linen or all spun rayon cloth will pass your Lux laboratory test with flying colors, or will pass any other test if properly dyed, that is applied to women's dress fabric. When you go beyond that then you have to go into something such as your shirting trade, where they require guaranteed fast colors. On that, with the price, there has been very little headway made.

Chairman Freedman: Well, in connection with that I would like to say that probably the reason for there being relatively little headway made is to be found in the use of the term "fast colors." Probably the speaker of the evening would like to give his interpretation of "fast colors."

Mr. Clark: I am not going to step on that spot.

Chairman Freedman: I believe the speaker is right in not wanting to step on it; but that really is one of the reasons for the lack of demand for the better type of materials, because from the consumer angle, his experience is that many materials are marked fast color on the selvage, and others, whether marked or not, are sold or offered for sale as fast color. The experience of the consumer with materials of that type, by and large, is such as to make the purchaser wary of materials. Then there appears to be no incentive for paying a greater price, because, no matter what price is paid, in so far as the ultimate consumer is concerned, he is likely to get something which is not satisfactory.

I interviewed a consumer today, who wanted to know what was meant by the term "fast color." That particular consumer's definition of fast color was this: A color which would not stain water when immersed in it. As you know, fastness evidently meant nothing to that particular consumer. There are so many meanings that are affixed to the term "fast color" that it would seem to me that textile chemists and colorists might well get away from the use of that term, and break it down into the various behaviors of colors to the different reagents or conditions to which the colors are exposed, such as fastness to light, washing, perspiration, sea water, chlorine, crocking, water, soaping and so forth.

So I thing that probably the dyers and the converters are missing up on some of the better business because of the ambiguity attached to the term "fast color."

Mr. Clark: There is no doubt that that is true. Furthermore, when you come to produce a full line of shades in any fabric, your fastness will vary over that range of shades. When you get into dark shades you have crocking to worry about. Maybe you have light fastness to worry about in some of your pastel shades, because the vat colors, many of them, in very pale tints, are nowhere near as fast as the fastness in the darker shades would lead you to believe. Then you often compromise, as I said before, with price. For instance in dyeing the browns with the sulfur colors, you may have a range of shades, only napthol and vat, except for the browns and blacks, which are sulfur, and you can't compare their fastness with those of the napthols and vats.

Chairman Freedman: Mr. Clark, we certainly have enjoyed your talk and exposition of the subject of dyeing of linens and cotton fabrics this evening. It has been a pleasure to have you here. We certainly have learned a great deal about the subject. I believe the reason why there have not been more questions is based upon the fact that you have gone into the subject so thoroughly and so minutely.

Mr. Dougan: I move that we extend the speaker of the evening a rising vote of thanks.

. . . The motion was duly seconded and carried by a rising vote of applause.

The Oxidation of Wool

*Photochemical Oxidation**

By ARTHUR SMITH and MILTON HARRIS**

The photochemical decomposition of wool has been investigated. The deterioration, as evidenced by the decrease in cystine content and the increase in alkali-solubility, ammonia nitrogen and sulfate sulfur, is accelerated by acids and decelerated by alkalies. The extent to which wool is degraded during irradiation is directly proportional to the decrease in cystine content and to the increase in alkali-solubility.

The sulfur content of untreated and of acid-treated wool decreased during irradiation. The data suggested that a portion of the sulfur in wool is converted to hydrogen sulfide, some of which is subsequently oxidized to sulfuric acid.

I. INTRODUCTION

THE photochemical decomposition of proteins, carbohydrates, fats, and many nitrogenous substances is an oxidation process which is accelerated by acids and decelerated by alkalies [1, 2, 3, 4, 5, 6, 7]. In the case of proteins and other nitrogenous materials, this oxidation process is generally accompanied by the cleavage of ammonia [2, 3, 4]. In earlier studies on the photochemical decomposition of silk [1, 2], it was shown that the amount of this ammonia is a measure of the extent to which silk is damaged by exposure to light [1, 2].

Wool, which is relatively more stable to light than silk,[8] is also oxidized during irradiation. The reaction, however, appears to be of a somewhat different nature, owing to the inherent differences in chemical constitution of the two proteins. The chief point of attack appears to be the disulfide group of the amino acid, cystine, which is present in wool but not in silk. This group is readily attacked by oxidizing agents and becomes more susceptible to the action of alkalies [9, 10]. The extent to which the wool is oxidized bears a functional relationship to the decrease in its cystine content and to the increase in the alkali-solubility of wool.

The present investigation was undertaken to extend our observations on reactions involving the disulfide group in wool and to determine the effect of irradiation on the sulfur and nitrogen in wool protein.

II. MATERIALS AND METHODS

The wool used in these experiments was worsted top and worsted yarn, each of which had been purified by extraction with alcohol and ether and finally washed with distilled water. The wool was placed in thin layers on cardboard strips and held in place by clips at each end. The samples were exposed to the radiation of a glass-enclosed carbon arc† for definite periods of time. The distance from the axis of the arc to the wool was ten inches.

The alkali-solubility was determined by a method previously described[9], the cystine content by the Sullivan method[11], the sulfate sulfur by the method of Mease[12] and the sulfuric acid by the pyridine method[13]. Ammonia nitrogen was determined by measuring that portion of the nitrogen which is liberated when the wool is boiled in a saturated solution of magnesium oxide. All data are calculated on the basis of the dry weight of the wool.

III. RESULTS AND DISCUSSION

The effect on worsted top wool of exposure to the radiation for different lengths of time up to 100 hours is shown in Table 1. The alkali-solubility, ammonia nitrogen and sulfate sulfur increase and the cystine content decreases with increasing time of exposure. The values in the last two columns of Table 1 are of special interest since they not only show that sulfuric acid is formed during exposure, but also that practically all of the sulfate present in the exposed wool is in the form of sulfuric acid. The formation of acid in irradiated wool has been previously noted or suggested by several investigators[14, 15, 16, 17] but only Von Bergen[18] actually demonstrated the presence of sulfuric acid.

TABLE 1

Effect on Wool Top of Exposure to the Radiation From a Glass-enclosed Carbon Arc for Different Lengths of Time

Sample No.	*Duration of exposure hours*	*Alkali solubility per cent*	*Cystine per cent*	*ammonia nitrogen mg/gm*	*Sulfate sulfur per cent*	*Sulfuric acid sulfur per cent*
1	0	11.9	12.2	0.28	0.06	....
2	5	14.5	11.9	0.21	0.07	....
3	15	17.2	11.1	....	....	....
4	30	21.9	10.4	0.71	0.22	....
5	50	32.2	8.6	0.68	0.25	0.21
6	100	36.2	7.9	1.22	0.37	0.34

*This is the third paper of a series of studies of the oxidation of wool.

**Research Associates from the American Association of Textile Chemists and Colorists at the National Bureau of Standards.

†Fade-Ometer, type F.D.A. Atlas Electric Devices Co., Chicago, Ill.

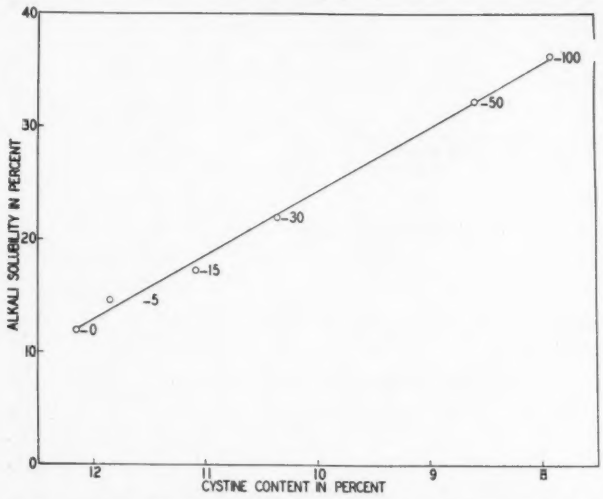

Fig. 1—The relationship between the cystine content and the alkali-solubility of wool exposed to the radiation from a glass-enclosed carbon arc. The figures on the curve represent the duration of exposure in hours.

In Figure 1 the increase in the alkali-solubility is shown to be directly proportional to the decrease in the cystine content. While previous work[10, 11] indicated a relationship, this is the first case in which it was found to be linear.

The effect of acid and alkali on the photochemical deterioration of wool was also investigated. Six-gram samples of wool yarn were soaked in 0.1 N solutions of hydrochloric acid and in sodium carbonate solutions of the same strength for 15 minutes at room temperature, centrifuged and dried in an atmosphere of 65 per cent relative humidity at a temperature of 70° F. Samples of untreated and acid and alkali-treated yarns were exposed to the radiation for 100 hours. The effect of the exposures is shown in Table 2. The deterioration of the wool, as shown by the decrease in the cystine content and the increase in the alkali-solubility and the ammonia nitrogen content, is greater in the acid-treated and less in the alkali-treated samples than in the untreated samples.

The total sulfur content of the untreated and the acid-treated samples decreased during exposure. This suggests the possibility that irradiation converts a portion of the sulfur in wool to a volatile form, for example, hydrogen sulfide. Hydrogen sulfide is readily ozidized to sulfuric acid which would account for the comparative ease with which some of the disulfide sulfur in wool is converted to sulfate sulfur. In view of the great difficulty with which even small amounts of sulfur in wool are oxidized to sulfate by oxidizing reagents[19, 20], the ease of oxidation of sulfur to sulfate by irradiation cannot be emphasized too strongly. It should be noted that while the total sulfur and sulfate sulfur contents of the alkali-treated sample are higher than those of the acid-treated sample, the total sulfur after extraction of the wool with pyridine is the same for both samples. These results are also readily explained on the assumption that hydrogen sulfide is formed as an intermediate product. It is obvious that the hydrogen sulfide would be volatile in the presence of acids but would react with alkali to form a non-volatile compound.

The experimental results reported in this paper indicate that although the photochemical decomposition of wool involves an oxidation reaction, the mechanism of the reaction is very different from that produced by oxidizing reagents such as hydrogen peroxide.* Further evidence supporting this is obtained by subjecting the exposed samples to the lead acetate test, described by the authors elsewhere[20]. The irradiated samples all gave strong positive reactions, indicating the presence of sulfide sulfur. Since it has previously been shown that the lead acetate test is negative when the sulfur is partially oxidized (for example, by hydrogen peroxide to a sulfoxide or sulfone) and positive when sulfide sulfur is present, the results of the test clearly demonstrate the existence of at least two mechanisms for the oxidation of sulfur in wool.

We wish to express our appreciation to Mr. G. E. Hopkins of the Bigelow-Sanford Carpet Co., Inc., for furnishing a number of the light exposed samples used in this work.

IV. REFERENCES

[1]J. Research N B S *7*, 1179 (1931) R. P. 395.
[2]Ibid *13*, 151, (1934) R. P. 697.
[3]J. Phys. Chem. *32* 1263 (1928).
[4]Biochem. Z. *239*, 250 (1931).

*The available data do not warrant suggesting at this time a specific mechanism for the action of light on the cystine in wool. Experiments now in progress indicate that the first step is a splitting of the disulfide group accompanied by the liberation of hydrogen sulfide whereas in oxidation with hydrogen peroxide, intermediate products of the sulfoxide, sulfone, etc. types are formed.

TABLE 2

Effect on Untreated, Acid-treated and Alkali-treated Wool of Exposure to the Radiation from a Glass-Enclosed Carbon Arc for 100 hours*

Treatment	*Total sulfur per cent*	*Total sulfur after pyridine extraction per cent*	*Sulfate sulfur per cent*	*Sulfuric acid sulfur per cent*	*Cystine sulfur per cent*	*Alkali-solubility per cent*	*Ammonia nitrogen mg/gm*
Untreated—unexposed	3.61	....	.02	.01	3.40	11.6	.36
Untreated—exposed	3.43	3.25	.24	.27	1.92	53.0	1.65
0.1 N hydro-chloric acid	3.35	3.30	.14	...	1.66	67.8	2.24
0.1 N sodium carbonate	3.65	3.29	.24	...	2.21	47.7	1.48

*—These exposures were made on a different Fade-Ometer and the results of these experiments are not strictly comparable with those recorded in Table 1.

[5]Fabrics Coordinating Research Dept. Sci. and Ind. Res. First Report. 10 (1926).
[6]Ibid. Second Report 95 (1930).
[7]Wyoming Ag. Exp. Station Bull, 131 (1922).
[8]Text. World *74*, 159 (1928).
[9]J. Research N B S *15*, 63 (1935) R. P. 810.
[10]Ibid *16*, 301 (1936) R. P. 875.
[11]Public Health Reports 86, (1930).
[12]J. Research N B S *13*, 617 (1934) R. P. 731.
[13]J. Text. Inst. *26*, T87 (1935).
[14]Chimica Industria (Italy) *17*, 82 (1935).
[15]Compt. Rend. *183*, 596 (1926).
[16]Text. Angus *7*, 753 (1930).
[17]J. Text. Inst. *27*, T25 (1936).
[18]Melliand Text. Monthly *2*, 9 (1930).
[19]J. Biol. Chem. *110*, 343 (1935).
[20]J. Research N B S *16*, 309 (1936) R. P. 876.

ONE HUNDRED AND FIRST MEETING OF THE RESEARCH COMMITTEE

THE one hundred and first meeting of the Research Committee followed the Council meeting on Friday afternoon, June 12, 1936. Present were Chairman Louis A. Olney presiding, J. R. Bonnar, E. C. Bertolet, W. H. Cady, Hugh Christison, R. E. Derby, W. C. Durfee, Hans Meyer, W. R. Moorhouse, G. A. Moran, W. M. Scott, W. S. Williams, Ben Verity, and H. C. Chapin.

Kenneth H. Barnard and Harold DeWitt Smith were elected members of the committee.

Through a letter from Dr. Rose was presented a proposal from the British Society of Dyers and Colourists to confer with them on dye fastness grading through representatives of British firms on other business in this country, and of Americans engaged likewise in Europe. It was voted that if possible a Research Committee meeting with a British representative present be arranged for some date early in the fall, presumably in New York.

It was reported by Mr. Durfee that 19 crock meters had been sold, and half the net profit on payments received paid to the Association. He described a survey of the patent literature and stated that he had applied for a patent on the Association machine. He emphasized the importance of avoiding loose dirt on the fabrics under test. Mr. Christison suggested adoption of a standard white fabric to receive the crock mark, and the committee selected 80 x 80 bleached but unsized print cotton cloth. It was arranged that a sample be sent with each machine, and that further supplies be made available through the Chairman of the Research Committee.

Professor Bertolet was made Chairman of the Committee on Fastness to Perspiration, replacing Mr. Christison, who remains a member of the committee. Mr. Christison advocated institution of another classification, and suitable test, which would permit acceptance of the faster acid colors under specified limits.

Mr. Christison reported for the Committee on Determination of Extraneous Matter in Textiles, outlining the research already started by Mr. Ryberg on wool. Mr. Cady described further progress of Dr. Glarum on printing pastes, and the Committee on Chemistry of Wool Fiber reported by letter.

Respectfully submitted,

HAROLD C. CHAPIN,
Secretary.

OUTING, PHILADELPHIA SECTION

THE Philadelphia Section held its annual outing on June 19, 1936, at the Whitemarsh Valley Country Club. During the day there were totals taken for prizes in golf, trap shooting, and other sports. The prizes were awarded during the dinner after which was offered our slate of officers for the coming year, as follows:

Chairman, Herbert S. Travis; Secretary, R. W. Delaney; Treasurer, Harold B. Dohner; Vice-Chairman, Wm. Ebersold; Sectional Committee, D. McGowan, Jr., Wm. S. Stringfellow, Walter H. Hamlen, Jr., Boyce B. Bond, Leroy G. Stolz; Councilor, R. M. Ritter; Philadelphia Representative for Nominating of Officers at the National Convention, Charles C. Seibert.

Following this was offered an elaborate floor show which was met with sincere approval.

There were 310 guests and members present.

Respectfully submitted,

R. W. DELANEY,
Secretary.

ANNUAL OUTING, MID-WEST SECTION

THE annual outing of the Mid-West Section was held at Oshkosh, Wisconsin, on June 20, 1936, there being 92 members and guests present. Luncheon was served at the Ridgeway Country Club and dinner was held at the Raulf Hotel. Arrangements were in charge of Mr. George Warburton and he and his Committee deserve great praise for their work in making a distinct success of the outing.

Sixty-seven members and guests participated in the golf tournament, 26 prizes being awarded, principal prize winners being as follows:

First Low Net, Class A—H. T. Latham, E. I. du Pont de Nemours & Co.

First Low Net, Class B—Dr. H. H. Tucker, J. Laskin & Sons, Inc.

First Low Net, Class C—Eric Hempel, Bradley Knitting Co.

First Low Gross, Class A—Al Rathke, B.Z.B. Knitting Co.

First Low Gross, Class B—S. A. Berry, Olson Rug Co.

First Low Gross, Class C—E. K. Rice, National Oil Products Co.

Low Net Guest Prize—Mr. Remus, North Star Woolen Mills.

Low Gross Guest Prize—T. E. Fitzmaurice, Allen-A Co.

A letter of appreciation was sent to the donor of each prize awarded in the tournament.

During the dinner, a telegram was received from the Quebec Section of the Canadian Association of Textile Chemists and Colorists, which was meeting that same night at the Mount Royal Hotel, Montreal, extending greetings to the Mid-West Section.

A rising vote of thanks was given to Mr. George Warburton in appreciation of his efforts in contributing to the success of the outing, and the meeting was adjourned at 9:00 P. M.

Respectfully submitted,

ELIAS A. JOHNSON,
Secretary.

ONE HUNDRED AND EIGHTH COUNCIL MEETING

THE Council held its one hundred and eighth meeting at the Engineers' Club of Boston in the morning and early afternoon of Friday June 12, 1936. Present were President William H. Cady presiding; Elmer C. Bertolet, Vice-President; William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; Roland E. Derby, Ben Verity, and Hans Meyer, representing Northern New England, Rhode Island and New York, respectively; and Harold C. Chapin, Secretary. The report of the one hundred and seventh Council meeting was approved. The Treasurer's report of June 11, and the Secretary's balance sheet attached hereto, were accepted.

An outline of the program for the Annual Meeting, December 4 and 5, was received from the Providence Committee. An appropriation was voted for a temporary assistant to continue light fastness tests under Mr. Appel at the U. S. Bureau of Standards this summer. Mr. Cady, Mr. Ariente and Mr. Verity were appointed a committee to publish with approval of the Council, specifications on safe and unsafe oil removers submitted by Mr. Cady.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

Active

J. A. Barrington, G. N. Bond, Jr., A. J. Buchanan, H. L. Dozier, G. A. Foye, W. K. Gander, S. R. Hamilton, N. T. High, A. S. Kohout, E. C. Kontz, Jr., A. L. Lippert, J. F. Magill, F. W. Marzahl, F. Meleleu, J. N. Miller, J. L. Moore, W. S. Pride, G. W. Sharpe, H. D. Sharpe, C. H. Schepmoes, J. H. Turley, L. B. Wimpenny

Junior

L. M. Adams, L. G. Atkins, J. E. Jones, H. G. Keziah, R. L. Rhodes, Jr.

Associate

W. Atkinson, J. C. Bach, J. Pfister, J. B. Williams

Student

E. F. Brano, A. J. Cherr

A. F. Gallagher and H. E. Kiefer, Jr., were transferred from other classifications to Active membership.

Respectfully submitted,

HAROLD C. CHAPIN,
Secretary.

SECRETARY'S BALANCE SHEET—JUNE 11, 1936

	Applications	*Dues, Regular and Reinstate*	*Dues, Sustain. and Contrib.*	*Dues, Corporate*	*Miscellaneous*	*Bank Charges*	*Totals, Net*
Received by Secretary, Nov. 1, 1935, to April 9, 1936.....	$727.50	$6,635.35	$255.00	$1,675,00	$538.46	—$2.83	$9,828.48
Received by Secretary, April 9, 1936, to June 11, 1936.....	165.00	312.50	10.00	250.00	155.84*	— .24	893.10
Total receipts	892.50	6,947.85	265.00	1,925.00	694.30	— 3.07	10,721.58
Transmitted to Treasurer.....	872.50	6,927.85	265.00	1,675.00	688.37	...	10,428.72
Leaving to order of Secretary..	20.00	20.00	.....	250.00	5.93	— 3.07	292.86

Miscellaneous items:*

DYESTUFF REPORTERS	$19.60	Year Books	32.13
Dyed standards	83.88		
Knitted tubing	20.23	Total	$155.84

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GERMAN CHEMICAL EMPLOYMENT

ACCORDING to a report from Consul Sydney B. Redecker, Frankfort-on-Main, made public recently by the U. S. Commerce Department's Chemical Division, the accelerated activity in the German chemical industry in recent years has greatly reduced the number of unemployed chemists in that country. It is stated that this increased activity has resulted, in large part, due to the national policy of encouraging the use of domestically-produced substitutes for imported natural materials.

The resultant increased demand for chemists, especially in chemical and related branches of industry, has reduced the number of unemployed professional chemists in Germany from 1,430 at the end of 1932 to 970 at the end of 1935, a decline of approximately 32 per cent. It has been estimated that in 1935 Germany's professionally active chemists totalled about 12,000 and so it would appear that all but 8 per cent were occupied in some gainful capacity at the close of the year. According to the estimate, about 4,900 of the total number occupied are engaged in the chemical industry proper, 4,400 find employment in other industries, 350 are located in public laboratories and 1,300 are occupied in university work or public service.

Considerable expansion has taken place during the last several years in Germany's industrial production, particularly in chemical synthetics. In comparing production in 1935 with that in 1932 the report states that the output of motor fuel from domestic materials has increased from 500,000 to 1,000,000 metric tons; rayon from 27,000 to 50,000 tons; staple fiber from 3,000 to 20,000 tons and elemental sulfur from 3,000 to 20,000 metric tons.

Whereas the chemically produced "ersatz" substances just mentioned accounts for a great deal of the decrease in unemployment of German chemists, Germany's output of numerous other chemical products has also recorded marked expansion in recent years. Among these products are included medicinal preparations, synthetic plastics, tar and mineral colors, fine chemicals and photographic chemicals. This expansion has been in line with the increased production and sales of chemicals in all chemical producing countries during recent years.

The important fact to be remembered is that as the world supply of natural resources declines we will have to depend more and more upon the chemist to synthetically produce the natural products. Because of economic conditions in an individual country this synthetic production may be hastened as it has been in Germany; in some instances the synthetic product has proven superior to and cheaper than the natural; we must all be grateful for the work of the chemist.

—— ♦ ——

A PRELUDE TO CRISIS

MANY signs portent an enormous expansion of our chemical activities. But the development of the forthcoming chemical area is predicated upon a natural system of economics in which normal supply and demand are not abrogated by government control of production and prices. No other industry has so great a stake in the future of America and no other has more to loose under any system of planned economy be it either reactionary or socialistic. The progress in greater output and lower prices, in the highest wages and satisfactory net earnings on investment, has been won by individual initiative spurred on by real competition in the chemical field; and the impact of political domination is the only possible obstruction that can stop this forward march.

We cannot be blind therefore to the many indications of political tendencies here and abroad that threaten to check chemical development, and we must needs be concerned with the presidential campaign upon which we are about to enter. More than this we must look ahead towards 1940 when (so astute political students tell us) the successful political party of 1936 cannot hope to reelect its candidate.

* * *

The gravity of this coming election strikes deeper than the candidates and their issues. It is quite comparable to that critical election of 1860, in that it will determine the whole trend of our government for another half century, for upon it will depend whether in 1940 we have a more-radical-than-Roosevelt opposed to a hard boiled reactionary or whether within the frame-work of the Constitution and upon the old American plan of government by the people and for the people, a liberal and a conservative candidate shall be presented to the electorate. Every person in American chemical industry should ponder this serious question and expound its real meaning to their friends and neighbors.—Editorial, *Chemical Industries* June, 1936.

Bleaching Cotton Goods*

Increasing Processing Efficiency and Avoiding Fabric Stains

By A. J. HALL, B. Sc., F. I. C., F. T. I.

FROM the theoretical viewpoint the bleaching of cotton goods to a white so that they may be finished in this condition or subsequently dyed in clear bright shades is not difficult to understand. At least, no difficulty is encountered provided that the processes are not examined too intensively as regards their physics and chemistry, for it must be admitted that below the surface there is much about scouring and bleaching processes which is not understood. But in actual practice there are many points and difficulties which demand careful attention if good results are to be obtained consistently.

One difficulty connected with the bleaching of cotton fabric is the avoidance of excessive oxidation so that patches of oxycellulose are not to be found in the bleached fabric. These patches reveal themselves when the fabric is dyed with direct dyes, especially in blue, violet, and grey shades; the patches appear lighter in color. If the oxidation is very drastic then the patches are not only different in color but they are tender so that the fabric can there be easily broken.

It has been discovered that cotton fabric containing oxycellulose patches can be dyed uniformly by means of vat dyes or with direct dyes from a bath made slightly acid with formic or sulfuric acid, but it is not therefore less important to trace the cause and so prevent the formation of the patches.

CAUSES OF OXYCELLULOSE STAINS

In textile literature it is stated that oxycellulose formation can occur in the kiering process by reason of the action of occluded air. For this reason it is recommended to fill the kier with the alkaline liquor used for boiling the fabric by running it into the kier from the bottom instead of at the top. The rising liquor obviously displaces the air more completely than does the downward falling liquor. But the writer has never during many years experience had an instance of oxycellulose formation due entirely to kiering with the presence of air pockets, and he is inclined to believe that this cause is seldom, if ever, responsible for the oxycellulose troubles which periodically visit all bleachers and dyers. On the other hand, there is a way in which kiering can indirectly give rise to oxycellulose formation.

When cotton fabric is kiered in the usual manner with a solution of caustic soda or soda ash or a mixture of both it is noticed that the fabric drawn out of the kier after the first boil usually contains numerous brown patches. These patches disappear during the second kier boil and thus they do not attract much attention. Examination of the brown patches shows that there is present organic matter of a reducing character, but the brown color is seldom due to the presence of iron. The brown patches probably consist of organic impurities removed from the cotton fabric which require a considerable period of digestion with the alkali of the kier liquor before they become solubilized. Hence the reason for their disappearance during the second kiering—they then become soluble.

But it has occurred that examination of the brown patches has shown them to contain iron. This once happened when trouble was experienced in finding oxycellulose patches in the fully bleached fabric. These patches were ultimately traced to the presence of iron in the brown patches. When the fabric was treated with chemick liquor in the usual bleaching process the iron catalytically accelerated the bleaching so that in those parts the cotton was excessively oxidized. Actually the source of entry of iron into the kier was found to be a corroded steam pipe line conveying heat to the kier and this was soon eliminated, but before this it was found that souring of the kiered fabric with warm dilute hydrochloric acid was sufficient to remove the iron so that no excessive oxidation occurred in the subsequent chemicking process.

EFFECTS OF MACHINE CORROSION

A further interesting example of the manner in which corroded bleaching machinery can cause trouble in bleaching can be given. Some few years ago great difficulty was experienced in the dyehouse on account of the presence of oxycellulose patches in the cotton fabric being dyed

*Canadian Textile Journal.

with direct dyes. The trouble at first occurred periodically but gradually it happened that a proportion of the fabric from each kier dyed patchy because of oxycellulose.

The hasty conclusion was drawn that something was wrong in the kiering. It was suspected that the fabric was not evenly packed in the kier whereby the kiering process was more drastic in some parts of the kier than in others. Also it was thought that occluded air in the kier caused the oxycellulose patches. Attention to these points proved to have no beneficial results. So convinced was the bleaching foreman that the trouble arose in the kier that the expedient was adopted of rewarding the boys who packed the fabric in the kier with sixpence for each kier which yielded fabric containing no oxycellulose patches, and strangely enough an improvement was noticed for a few kierings after this. But gradually the trouble came back with its customary regularity.

One day however an observation was made which gave a clue to the cause of the trouble and eliminated the possibility of this being in the kiering. The practice at this works was such that the fabric during bleaching (chemicking) was led through a rope washing machine containing bleach liquor and thence over an overhead winch to a cistern in which the fabric was piled down sufficiently long for the bleach liquor to achieve its purpose. The winch was high up and in a dark corner so that it was seldom observed clearly. On this occasion someone noticed that a piece of verdigris fell on fabric underneath the winch, and then it was remembered that the winch was of brass. Examination showed that the winch was much corroded and that in parts of it was green with verdigris. This was the cause of the oxycellulose trouble. The fabric, impregnated with bleach liquor, rubbed off some of the verdigris in passing over this winch so that when lying in the pile the copper present in this verdigris and in the fabric catalytically influenced the bleaching and caused oxycellulose formation. Immediately after this discovery, the brass winch was replaced by a wooden one and no further trouble from oxycellulose was experienced.

There may appear to be a considerable amount of carelessness associated with the above instance of oxycellulose trouble, but it is easy to be wise after the event and there are few dyehouses in which silly blunders are not committed at some time or another.

Before leaving the difficulties of bleaching associated with oxycellulose formation it may be useful to refer to yet one more instance of the manner in which metal impurities may cause irregular action of the bleach liquor. In this case it was the practice to pile the fabric (impregnated with bleach liquor) into cisterns made of tiled sides and having a wooden lattice bottom. In constructing the lattice bottom an experienced carpenter would, of course, peg the wooden strips together with wood pegs; he would know too much about the catalytic action of metals in bleach liquors to nail them together with ordinary iron nails. But on one occasion a temporary carpenter had repaired the lattice and he had used nails. The inevitable result was that fabric in contact with the lattice invariably became stained with oxycellulose at those points where the nails were present and these stains showed themselves as resist patches in dyeing. Quite a considerable amount of damage was caused by this simple mistake before the reason was discovered.

TREATMENT OF FULLY BLEACHED FABRICS

The moral of these examples is that on no account whatever must fabric impregnated with bleach liquor be allowed to lie in contact with a metal, especially copper and iron.

Turning now to the bleaching of cotton fabrics which are to be finished and sold as white goods it may be at once stated that considerably more care must be taken than when the fabric is to be dyed. Residual impurities left in the fabric after bleaching are liable to change in color during subsequent storage, and in particular, there is always a tendency for these impurities to become yellow and so give the originally snow-white fabric a cream appearance which is generally disliked. For this reason the fabric must be thoroughly kiered and chemicked.

In times past the writer has seen several attempts made to produce white goods by so-called quick methods, but they have never been successful. To obtain a satisfactory white it is necessary to give two full kier boils with a liquor containing caustic soda and soda ash, and then to follow this with chemicking. The incentive is, of course, to save time by carrying out only one kier boil and then chemick somewhat harder. It may be that some day reagents will be discovered which by addition to the kier liquor will enable one kiering to be satisfactory, but so far these reagents are not available. If one of the two kier boils is omitted there is always a likelihood of the finished goods becoming yellow during storage.

It will be remembered that in kiering, quite a small ratio of liquor to fabric is employed—often only 3:1. Consequently, during the kier boil the liquor becomes highly charged with impurities removed from the cotton fabric. When the fabric is drawn out of the kier it carries with it considerable proportion of this highly impure colored liquor, and in the washing process which follows, some of the impurities are made insoluble and adhere to the fabric. Thus it requires a second kiering to re-solubilize these impurities and remove them.

USE OF EMULSIFYING AGENTS AND DETERGENTS

From the above it may be gathered that while two kier boils are necessary there is no reason why each of these

should not be shortened by addition of suitable fat emulsifying agents and detergents to the kier liquor. As a matter of fact it is quite true that the addition of resin soap to a kier will enable the process to be shortened. Resin soap is one of the oldest reagents which has been found suitable for addition to kier liquors but in spite of this fact it is difficult to discover a better assistant even among the newer products now available.

Sulfonated fatty alcohols of the Igepon, Gardinol, and Lissapol type do assist kiering but the writer has not found them more efficient than a resin soap. Pine oil is also an excellent and cheap product which when added to a kier liquor much improves the whiteness of the fabrics ultimately produced. The pine oil can be added as such or it can be first emulsified with two parts of Turkey red oil and so made water-soluble.

An interesting and useful fact connected with kiering is that it is generally possible to secure a better white if the cotton fabric is soured with dilute hydrochloric acid before kiering. Of course this is an additional process and requires the use of rope washing machines, but it pays to carry it out in the case of very brown cottons and with fabrics for which a very clean white is required. Possibly the souring treatment removes certain inorganic salts which during kiering exert a mordanting action and retain colored impurities which might otherwise be removed by the kier liquor.

BLEACHING COTTONS WITH COLOR EFFECT THREADS

The bleaching of cotton goods containing colored effect threads demands considerable care if loss of color or bleeding of the color on to the white parts of the fabric is to be avoided. Of course, it is only possible to obtain satisfactory results if the colors present are of a fast type. Thus the fabrics should have the effect threads dyed with vat or naphthol dyes.

Two defects must be guarded against in bleaching processes of this kind. Firstly, deterioration of color by bleeding or destruction, and secondly, tendering of the fabric by reason of the dyes present catalytically accelerating the action of the chemick liquor. Certain vat dyes can cause rapid tendering of cotton when present during bleaching with a hypochlorite solution.

Generally, vat dyed effect threads are not so liable to bleed as are the naphthol dyes. These latter are much more dangerous especially if large quantities of fabric are kiered under pressure at one time. At the present time considerable improvements are being made in naphthol dyes so that a number of these now have the necessary fastness requirements to enable them to be present in goods which have to be subjected to kiering.

It is a matter of experience that the pH of the chemick liquor makes a great deal of difference to the degree to which the vat dyed effect threads are changed in color during bleaching. Some vat dyes are faster to an acid bleach liquor, while others are most fast in an alkaline liquor. On the whole it is better to use a bleach liquor of pH about 8 or 9, slightly alkaline, but it must be remembered that under such conditions bleaching of the cotton proceeds more slowly than at lower pH values. In every case, the bleacher must carry out preliminary trials with colored goods with whose fastness properties he is unfamiliar.

PRECAUTIONS NECESSARY WITH DIFFERENT DYESTUFFS

One instance can be cited here which will show that nothing must be taken for granted in bleaching colored goods. In general, it would be considered that the faster the colored threads present in the goods being bleached the less troublesome they would be. This is not necessarily true. Thus in one case excellent results were being obtained in the bleaching of cotton fabric having a blue selvedge. This selvedge contained threads dyed with an *indigo* blue vat dye. Now as is well known, an indigoid vat dye is not so fast as an anthraquinone vat dye. So that when the manufacturer substituted threads dyed with a dark blue *anthraquinone* vat dye it was anticipated that no trouble would ensue. In actual experience the reverse was the case, and the result ended in a law suit. The facts of the case were substantially as follows.

When the selvedge was colored with an indigo blue dye a certain amount of bleeding took place during the kiering so that the remainder of the fabric became stained blue in parts. But during the chemicking which followed these stains were removed owing to the poor fastness of the dye to chlorine. In the case when the selvedge was colored with an anthraquinone blue dye similar staining took place during kiering but owing to the superior fastness of the dye to chlorine these stains were not removed in the chemicking. As a matter of fact it was not possible to remove the stains by any method which did not at the same time remove color from the selvedge. The result was that the fabric was spoiled and certain claims for damage had to be met.

The above incident shows that the bleacher must consider the bleaching of colored goods from all viewpoints if he is to avoid troubles arising from loss of color or bleeding. An excellent maxim is that of never to process a large bulk of fabric without first ascertaining by preliminary trial whether or not the colors are sufficiently fast to the process of bleaching employed. A little loss of time in making such tests can often save a much larger amount of time and trouble such as would be caused by spoiling a large amount of fabric.

New Products—Trade Notes

• ORGANIZES BUSINESS

Paul O. May, formerly agent in the Chicago district for the Commonwealth Color & Chemical Co., announces that he has established his own business and will represent several Eastern factories and importing companies. His offices will be located at 509 North Wells St., Chicago, Ill.

Mr. May entered the chemical field with Kalle & Co., and after considerable experience in all departments, represented them in the West, starting the Chicago branch of the Kalle Color & Chemical Co. in 1913. During the war the name was changed to the Color Service Corp., which was later taken over by Klipstein and then merged with the Commonwealth Color & Chemical. Co.

• GENERAL RELEASES

General Dyestuff Corp. announces release of the following new circulars. Copies are available upon request.

Celliton Discharge Yellow 5 R L—an acetate color producing a golden yellow shade said to be easily dischargeable to a clear white with Decroline Soluble Conc. The product is also said to be very suitable for direct printing. Circular I.G. 1173.

Naphtol AS-DB—an addition to their large range. A great number of desirable full brown shades of good all around fastness are said to be obtainable with specially chosen coupling agents. Circular I. G. 1162.

Supranol Brown 5 R—a new acid color brought out by the I. G., which when dyed from a Glauber's salt-acetic acid bath produces bright reddish brown shades said to be of good fastness to washing, salt-water and light and to be especially suitable for the dyeing of knitting yarn for sweaters, bathing suits, etc. It is further said to exhaust well from a neutral bath and is recommended by the manufacturers for shading the wool in union dyeing. This product is said to have very good affinity for both pure and tin weighted silk. Circular I.G. 1171.

Fast Red F G Base—which on Naphtol AS-SW impregnation produces clear yellow shades said to be of excellent all around fastness properties. The new base is said to be distinguished by its excellent stability. Circular I. G. 1178.

Algosol Olive Green I B—a new addition to the range of water soluble vat dyestuffs producing bluish green shades said to be of excellent fastness to light, washing and chlorine either printed or dyed. Circular Sol. 63.

• CAMPBELL RELEASE

John Campbell & Co. announce release of the following new product:

Amalthion Bright Green 3 G Y Conc.—an addition to the Campbell sulfur colors, a very brilliant yellow shade of sulfur green, considered by the manufacturers to be the best, brightest and yellowest shade of sulfur green on the market. It is said to be a straight dyestuff, containing no yellow or other shading agent. It is claimed to have superior solubility, requiring only one-half the amount of sodium sulfide as dyestuff. It is recommended by the manufacturers for the dyeing of raw stock, yarn and piece goods. It is suitable for machine and jig dyeing. It is said to have excellent fastness to alkali, rubbing, fulling and cross dyeing.

• TO MANUFACTURE CELLULOSE ACETATE

Negotiations have just been completed between Hercules Powder Company, of Wilmington, Delaware, and the I. G. Farbenindustrie Aktiengesellschaft, of Frankfurt, Germany, by which Hercules comes into control of the American patents covering the I. G. processes on manufacturing cellulose acetate.

M. G. Milliken, general manager of the Cellulose Products Department, stated that Hercules expects to be in quantity production of flake cellulose acetate by this December. The experimental and pilot units at the company's extensive cellulose products plant at Parlin, N. J., have been running successfully for several years and a material of high quality with improved properties is being produced.

Work on the new large-scale plant is progressing. In its construction, the most modern units of equipment are being installed throughout so that economical operations and high quality will be assured.

• WORLD DYE OUTPUT

World production and distribution of coal-tar dyes increased substantially in 1935 with most of the world's leading producers reporting gains both in domestic and foreign sales, a survey just completed by C. C. Concannon, Chief of the Commerce Department's Chemical Division, shows.

While production data are not yet complete, the survey indicates that the world output of coal-tar dyes in 1935 was from 10 to 15 per cent greater than the estimated 211,000 metric ton production in 1934, it was stated.

Germany, the United States, Great Britain, Soviet Russia, Japan, Italy, France, Switzerland, and Poland, are now the world's leading producers of coal-tar dyes. While there still exists a considerable trade in certain types of dyes between these countries, all of them appear to have attained a high degree of self-sufficiency, according to Mr. Concannon.

All of the countries mentioned except Germany and Switzerland have so far concentrated largely upon producing for the domestic market but most of them have developed an export trade, particularly with China and British India and other countries which are still either partially or wholly dependent upon foreign sources for their dye requirements, according to the survey.

While Germany is known to be the world's leading producer of dyes, official statistics regarding its output are not available. Estimates placed the output in that country at approximately 76,000 metric tons in 1934, compared with 66,000 tons during the preceding year, and 75,000 metric tons in 1929. From all indications further production gains were made in 1935, it was stated.

A substantial part of the German output is exported, the bulk going to Oriental markets, chiefly China and India. Exports in 1935 aggregated 33,933 metric tons compared with 33,593 metric tons during the preceding year.

Production of coal tar dyes in the United States in 1935 totalled 45,480 metric tons, which was only 9 per cent under that of the peak year 1929, statistics show. Exports during 1935 aggregated 8,800 metric tons, valued at $6,873,400, a volume increase of approximately 15 per cent and a value increase of approximately 22 per cent compared with 1934. Analysis shows that while Japan, China and Canada are outstanding markets for United States coal-tar dye products—the three together taking more than half the total—substantial shipments were also made to a number of other countries, including British India, the United Kingdom, Belgium, Germany, Mexico, Argentina, and Brazil, according to Mr. Concannon. In April of this year shipments were consigned to 46 countries, he stated.

Coal-tar production in the United Kingdom aggregating 26,250 metric tons in 1935, an increase of almost 11 per cent over 1934 and 1,340 tons greater than during the peak year of 1929. Exports increased from 4,478 metric tons in 1934 to 5,066 tons during the past year.

Coal-tar production in Japan has been

mounting at a remarkable rate in recent years. During 1934, the last year for which figures are available, the output aggregated 17,116 metric tons compared with 15,973 tons during the preceding year, and 7,796 tons in 1929. Judging from activity in Japan's textile industry last year it is likely that the 1935 dye output was considerably greater than in the preceding year. Japan's dye exports amounted to 8,745 metric tons last year, according to the Commerce Department.

The Soviet dye industry has also made rapid strides in recent year, the output in 1935 totalling approximately 25,000 metric tons according to unofficial reports. Except for special dyes, the entire local demand is supplied by the Domestic industry.

Italy produced about 12,730 metric tons of coal-tar dyes in 1934, compared with 8,122 tons during the preceding year. While data for 1935 are not yet available it is believed that the industry continued to progress.

French dye production in 1935 has been reliably fixed at 10,650 metric tons against an output of 10,350 tons during the preceding year, while Switzerland's output declined slightly to about 6,900 metric tons last year, 95 per cent of which was exported, according to the survey.

• CARBIC RELEASE

Carbic Color & Chemical Company announces release of a circular on the following new product:

Indigosol Olive Green I B—the latest addition to the range of Indigosol colors said to be characterized by very good all round fastness, with maximum fastness to light. It is said to be of special interest for fast plain shades as a self color as well as in combination with other Indigosols for a variety of olive and khaki shades. It is further said to be easily soluble and may be applied by any of the methods in use.

It is stated that as paddings cannot be sufficiently well reserved by the usual resists it is recommended to use Reserve X by means of which it is not only possible to obtain excellent white resists but also very fine colored resists with vat colors or Pharmasols under this Indigosol.

Like Indigosol Blue I B C the Olive Green is said to be one of the easily developed Indigosols; it is stated that it will be advisable to develop at a temperature not higher than 20° C. (68° F.) and to work with a minimum amount of nitrite in order to avoid over oxidation.

Copies of the circular (Sol. 63 U. S.) describing the above mentioned color more completely are available upon request.

• JOINS SANDOZ

Dr. J. E. Meili is now affiliated with the Sandoz Chemical Works, Incorporated, in the capacity of technical adviser and demonstrator.

He has been connected with the textile industry for the past thirty years and has specialized in the handling of silk, acetate, and rayon.

Dr. Meili's services will be available at all times to help interested parties to solve their difficulties in dyeing and printing.

• COLUMBIA WOOL COURSE

University Extension, Columbia University of the City of New York announces the appointment of Werner von Bergen, Chief Chemist of Forstmann Woolen Company of Passaic, New Jersey, as a teacher of a new evening course in Woolen and Worsted Manufacture. This course will be given for the first time this fall on Monday evenings in Room 358 Chandler Building from 7:30 to 9:20 p.m. and consists of fifteen lectures, one each week, beginning September 28th.

The course will be especially designed to meet the requirements of the trade in New York and vicinity. It will cover all phases of woolen and worsted yarn and fabric manufacture and is illustrated with samples, lantern slides and films.

Mr. von Bergen is well known in the trade, a member of the U. S. Institute for Textile Research, American Chemical Society and American Association of Textile Chemists and Colorists. He is also chairman of Section I, Sub-committee A-3 on Wool of the American Society for Testing Materials. Since 1930 he has been an instructor of various courses sponsored by the Carl Forstmann Memorial Foundation also known as the Forstmann Institute at the plant of the Forstmann Woolen Company.

• MAY CHEMICAL EXPORTS

United States exports of chemicals and related products continued to advance in May attaining the highest point that has been reached in several years with every important item on the list except turpentine sharing in the gain, according to C. C. Concannon, Chief of the Commerce Department's Chemical Division.

The value received for such exports aggregated $13,798,650 during the month compared with $11,171,000 in May, 1935, and $8,885,000 in May, 1934, preliminary statistics show.

Exports of coal-tar products were valued at $1,278,500 in May, an increase of approximately 57 per cent over the same month last year when shipments were valued at $811,560. All items making up this group shared in the gain, particularly dye products, benzol, and crude and refined coal-tar. Dye products, valued at $620,000, accounted for half the total and compares with $558,650 for May, 1935. Exports of other finished coal-tar products aggregated $268,000 in value during the month.

• JULY TEXTILE RESEARCH

An outline program for the research on textile drying, which U. S. Institute for Textile Research is engaged in financing, is published in the July issue of that organization's magazine, *Textile Research*. "The ultimate goal for this work," it states, "is to provide sufficient information so that any kind of textile material can be dried with maximum speed and economy, but with minimum damage to the quality of the product." A fund of $5,000 is needed for this study and subscriptions of $100 each are sought, this sum qualifying co-operators to receive confidential progress reports of the study, and also gives them Contributing membership in the Institute at no extra charge. Only 30 per cent of the fund has been subscribed thus far, although the 150 textile men who attended the conference in May on this subject voted unanimously to have U. S. Institute undertake the financing and conduct of the project.

Other noteworthy features of the July Textile Research are the report of a study of "The Retentivity of Water by Purified Cellulose," by Homer A. Hamm and Prof. W. A. Patrick, and the summary of a basic research on the properties of starches reprinted from the Journal of the Textile Institute (England). The latter study was conducted at the Shirley Institute of the British Cotton Industry Research Association by Richardson, Higginbotham and Farrow and is entitled "The Reducing Power and Average Molecular Chain-length of Starch and Its Hydrolysis Products, and the Constitution of Their Aqueous Pastes."

• duPONT RELEASES

The Dyestuffs Division of E. I. du Pont de Nemours & Company has just announced one addition to its "Pontachrome" line and three additions to its "Acetamine" line of Dyestuffs.

"Pontachrome" Blue ECR—a new chrome dye which produces brilliant reddish shades of blue on wool rawstock, yarn and piece-goods. It is said to be a level dyeing color, readily soluble. It is said to penetrate and exhaust well so that it is adapted to use on ladies' dress-goods, knitting yarns, men's suiting and similar materials. It is also said to exhibit very good fastness to fulling, salt water, rubbing, perspiration and carbonizing and is farily resistant to light. "Pontachrome" Blue ECR will prove of interest in self shades as well as in brightening navy

blues when employed as a shading color.

"Acetamine" Brown GD, "Acetamine" Brown SR and *"Acetamine" Dark Brown S*—three new dyes for acetate fibers, produce, respectively, yellow, red and neutral shades of tan and brown. It is claimed that all of these products are exhausted rapidly at temperatures between 180° and 190° F. and level, penetrate and exhaust satisfactorily. Furthermore, it is said that they are not affected by metal dyeing apparatus. The resultant dyed shades are said to be resistant to dry cleaning and to show good fastness to light. The principal use of the new offerings will be in the production of popular brown shades of linings, dress-goods and all types of acetate fiber novelty materials.

"Pontachrome" and "Acetamine" are registered trade-marks of E. I. du Pont de Nemours & Co., Inc.

• CONFERENCE ON RAYON

National Textile Technical Conference in Washington, D. C., next May, is being planned under the co-sponsorship of the Textile Division of the American Society of Mechanical Engineers, United States Institute for Textile Research, Committee D 13 of the American Society for Testing Materials, and the American Association of Textile Chemists & Colorists. Representatives of those associations held a meeting on June 15, in New York, at the call of Mr. C. H. Ramsey, Chairman of the A.S.M.E. Textile Division, and decided to recommend joint sponsoring of the Conference. A two-day session is planned next May for the discussion of technical developments in the manufacture and processing of rayon and acetate yarns and fabrics. The tentative program calls for the presentation of papers on the following subjects: Air Conditioning in the Manufacture of Synthetic-Fiber Fabrics; Warp Sizing of Rayon and Acetate Yarns; Processing of Rayon and Acetate—Including Soaking of Rayon Crepes and Gray Embossing, Dyeing, and Finishing of Rayons and Acetates; Testing of Rayon and Acetate Yarns and Fabrics; Corrosion of Rayon Equipment; Manufacture and Utilization of Staple Fibers. Attending the organization meeting were Prof. Louis A. Olney, Lowell Textile Institute, and B. L. Hathorne, consulting chemist, New York representing the A.A.T.C.C.; Dr. H. D. W. Smith, A. M. Tenney Associates, Inc., and P. A. Johnson, Aspinook Co., representing U. S. Institute; Dr. W. Bonnet, Viscose Co., and Ephraim Freedman, R. H. Macy & Co., representing Committee D 13; C. H. Ramsey, Morrison Machine Co., and Mark Golrick, Dutchess Bleachery, representing Textile Division A.S.M.E., and P. T. Wetter, staff member A.S.M.E.

Mr. Ramsey, in calling the representatives together, stated, "There is an evident need for a National Textile Technical Conference, and it is potentially of great importance to the textile industry. Such a Conference will bring together engineers, chemists, and other groups of technicians. If this first conference is as successful and productive as is anticipated, it may prove to be the forerunner of a series of annual technical meetings of a similar nature for the discussion of other textile problems. A National Conference of this type cannot, of course, take the place of the regular meetings of the co-sponsoring organization but it can serve as a useful supplement to them and become a clearing house for the exchange of ideas between all those who are contributing to the technical advancement of the textile industry. Here the research chemist, the physicist, the dyer, the plant engineer, the chemical manufacturer, and the machine builder can gather—say once a year—on common ground to exchange information on what they are doing to improve the quality of textiles and lower their cost of production. The importance of such an inter-exchange of ideas between the mill technician and the research worker, for example, cannot be overestimated."

• NEW YORK OFFICE

H. H. Arnold Co., Inc. of Rockland, Mass., manufacturers of Rubber Covering Machines, have opened a New York Office at 171 Madison Ave. W. S. Taylor is in charge. The sales in New York, New Jersey and contiguous territory will be covered from this office.

Technical Notes from Foreign Sources

Immunizing of Vegetable Fibers Dyed with Direct Colors

German Patent No. 490,100 (*January* 23, 1930).—(*addition to G. P. No.* 396,923 *of April* 4, 1922).—*Textil-Werk Horn A.-G. in Horn, Switzerland.*—The original patent covers a method of treating a cotton weave, previously impregnated with alkali, with an aromatic sulfon-chloride, especially toluene-p-sulfon-chloride; the so treated fabric, whether dyed with vat dyestuffs or undyed, being there—after not of affinity for direct cotton dyestuffs. The present modification of this procedure consists in predyeing the fabric with suitable direct cotton dyestuffs before the treatment with alkali and the sulfon-chloride, the goods being then capable of being dyed with suitable basic or acid or acid-mordant dyestuffs. The goods dyed with direct cotton dyestuffs and then immunized are able to take up basic colors, certain acid dyestuffs, and certain acid-mordant colors, so that considerable variations in effect are possible.

A further point to be noted is, that the direct dyeings are much faster to washing and kiering after immunization.

Orange Vat Dyestuffs (Anthanthrone Series)

German Patent No. 500,323 (*June* 20, 1930)—(*addition to G. P. No.* 458,598 *of November* 8, 1925)—*L. Cassella and Co.*—(See the preceding patent, No. 492,344, also a supplement to the original patent here mentioned.)

The present supplement applies to the principal patent and to its supplementary patent No. 492,344, abstracted above. The process here covered consist in starting not with anthanthrone itself, but with its preceding fundamental intermediate, carrying through first the condensation to anthanthrone, and then halogenating this, in the same medium, without isolation of the half-way product.

Thus, one part of 1-1'-dinaphthyl-8-8'-dicarbonic acid (see G. P. No. 445,390) is added to 9 parts of sulfuric monohydrate. Two mols. of water are split off, and the anthanthrone formed goes into solution with a green color. So much water is then added that a 90 per cent sulfuric acid is formed, a carrier, such as iodine, iron, ferric chloride, or ferrous sulfate, added, and chlorine passed in at about 50° C., with stirring, until the anthanthrone has disappeared. The isolation is carried out as in the preceding patent.

OPEN FORUM

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the Reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Answers

34—We are interested in obtaining what is known as a Mousseline de Soi permanent finish on chiffons and marquisettes.

The solution must be one that will not mark off and that can be applied either through a quetch or by immersion.—**B. P. D. W.**

Answer—There are a number of so-called Mousselin de Soi permanent finishes most of which are patented. These run all the way from treatment with concentrated sulfuric acid to impregnating with lacquer. A simple substitute for these consists of running the dried and framed marquisette or chiffon through a two-roll mangle where it is sized with a hot 5 per cent solution of brown ground glue. From the mangle the cloth is fed directly into a Palmer machine. If there is a choice between a Palmer-frame range and a Palmer the latter is preferable.

From the Palmer the fabric is once more run through a two-roll mangle containing a 6 per cent solution of potato starch to which has been added 1½ ounces of spermaceti wax for each pound of starch used. The fabric is then dried on a frame. One with a hot can on the delivery end is preferable. It is also best, but not always possible, to use a serpentine tenter frame as the latter aligns the threads much better than the usual type of swing tenter or plain tenter frame. The glue starch size is rendered insoluble by a final treatment in a hot hydraulic press. When the latter is not available several nips through a hot calender with all possible pressure will answer the same purpose.—B. H.

36—I would appreciate a method in which to overcome sleaziness in chiffon silk hosiery, if any.—**J. L. P. W.**

Answer—First see that the hosiery is in a bag of small net construction. If two-thread hosiery put it in an ordinary sugar bag. Presuming you are using a rotary type machine, I would suggest keeping the boil-off liquor low and thus use the foam method. Rotate the drum as little as possible. I suggest giving it a turn every ten minutes to each compartment. After this fill the machine with water to a dyeing level and rotate for ten minutes more. This I am sure will eliminate a great deal if not all of your sleaziness.—T. R.

37—I would appreciate information for positive identification of mildew on wool.—**L. D.**

Answer—There is, of course, only one positive method of identifying mildew on any fabric and that is the microscope examination of the material. If microscopic examination shows mold filaments (hyphae) or, better still, spore heads, then we may say definitely that the material has been mildewed.

It is more probable that what you refer to is the determination of the cause of spots. If these spots are caused by mildew and the material has been through any kind of wet treatment, the simple method described above will not work. In fact, there is no positive method under these conditions. The only way is to try to produce the mildew on a small sample, identify it before the wet treatment, mark it, and then put the sample through the treatment and see if the spot appears at the place marked.—Wm. G. Chace.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: By salesman who covered Philadelphia territory on oils, finishes, soaps, tints and dyes. Available at once. Write Box No. 903, American Dyestuff Reporter.

CHEMICAL ENGINEER, 30, 8 years experience, 2 years Du Pont Dyeing Laboratory, wishes to enter dyehouse. Initial salary no object. Write Box No. 907, American Dyestuff Reporter, 440 Fourth Ave., New York, N.Y.

COLOR MATCHER—required for printed rayon, cotton and acetate piece dye. State age, experience and references. Only expert matchers need apply. Apply Box No. 911, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Man 37, energetic, aggressive, seeks position, thorough knowledge of Dyestuffs and Chemicals; experienced office man and salesman. Write Box No. 913, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.